Programmatic Biological and Conference Opinion

and

Programmatic Letter of Concurrence and Informal Conference

for the

California Statewide Middle-Mile Broadband Network

Reference: 2022-0076259-S7-002-R001

U.S. Fish and Wildlife Service, Region 8

Issued to:

California Department of Transportation
and the Federal Highway Administration
Sacramento, California

Prepared by the Pacific Southwest Regional Office
U.S. Fish and Wildlife Service
Sacramento, California
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United States Department of the Interior

FISH AND WILDLIFE SERVICE

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In Reply Refer To:
2022-0076259-S7-002-R001

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Dear Jeremy Ketchum and Shawn Oliver:

This document transmits the U.S. Fish and Wildlife Service's (Service) programmatic biological and conference opinion (PBO), and programmatic letter of concurrence and informal conference (PLOC), based on our review of the California Department of Transportation's (Caltrans) and Federal Highway Administration's (FHWA) proposal to carry out or authorize construction of the statewide Middle-Mile Broadband Network (MMBN; project).

The PBO addresses your determinations that the proposed project may affect and is likely to adversely affect (LAA) 88 listed species, 40 designated critical habitats, 8 proposed species, and 1 candidate species in or adjacent to Caltrans' rights-of-way along approximately 10,000 miles of California's State Highway System (SHS). The PLOC addresses your determinations that the proposed project may affect but is not likely to adversely affect (NLAA) an additional 94 listed species, 22 designated critical habitats, 1 proposed species, and 4 proposed critical habitats.

We received your July 7, 2023, request for programmatic consultation and conference on July 10, 2023, and your April 9, 2024, reinitiation request the same day. Your requests and our response are made in accordance with section 7 of the Endangered Species Act of 1973, as amended [16 United States Code (USC) 1531 *et seq*.] (Act). Our programmatic conference opinion is made pursuant to 50 Code of Federal Regulations (CFR) 402.10.

All species and critical habitats for which you have made an LAA determination are addressed in the accompanying PBO and described in Table 1, below. Species and critical habitats for which you have made an NLAA determination are addressed by the PLOC and described in Table 2.

For proposed or candidate species and proposed critical habitats, Caltrans has made effect determinations and requested conference procedures. In the event that the species or critical habitat becomes listed (or designated) before project completion, the Service and Caltrans will follow procedures described in 50 CFR 402.10. We will hereafter refer to species and critical habitats addressed by the PBO or PLOC as covered species and covered critical habitats.

We have based the accompanying PBO and PLOC on information contained in:

- Your July 7, 2023, request for consultation, including the initiation letter (J. Ketchum, Caltrans, *in litt*. 2023) and programmatic biological assessment (PBA) (Caltrans 2023)..

- Your April 9, 2024, request for reinitiation, including the reinitiation letter (J. Ketchum, Caltrans, *in litt*. 2024) and revised PBA (Caltrans 2024).

Consultation History

A full consultation history is detailed in the PBA (Caltrans 2023). The following is a list of milestones:

August 15, 2022 – Caltrans requested early and ongoing coordination and technical assistance from the Service in advance of expected formal programmatic consultation for the MMBN.

April 3, 2023 – Caltrans requested the Service's review of a draft PBA. The Service completed the review on April 14, 2023.

April 28, 2023 – Caltrans requested initiation of formal consultation and conference on the MMBN.

May 1, 2023 – The Service began a 30-day sufficiency review of the PBA.

May 31, 2023 – The Service completed its 30-day sufficiency review and issued a response to Caltrans requesting additional information to initiate consultation. The Service included a comment matrix describing information needs for individual species and critical habitats with this response.

July 10, 2023 – Caltrans submitted a revised PBA. Formal consultation started.

July 27, 2023 – The Service completed review of the revised PBA and issued a response acknowledging initiation of formal consultation beginning July 10, 2023.

September 8, 2023, through November 9, 2023 – Caltrans submitted updated copies of PBA to address revisions and Service comments.

November 13, 2023 – Caltrans submitted a final PBA incorporating all previous comments and revisions.

April 9, 2024 – Caltrans submitted a revised PBA and reinitiation request to formally conference on 4 species proposed as threatened: northwestern pond turtle, southwestern pond turtle, western spadefoot (northern and southern DPS).

May 9, 2024 – The Service completed review of the revised PBA and issued a response to Caltrans acknowledging reinitiation of formal consultation beginning April 9, 2024. The Service included comments, to be addressed during the formal consultation period, with this response.

June 4, 2024 – Caltrans submitted a further revised PBA and response to Service comments. A final version of this document was signed on June 14 and submitted to the Service on July 15.

Table 1. Covered species and critical habitats addressed in the PBO (i.e., LAA species or critical habitats based on Caltrans' determinations).

Species Common Name	Species Scientific Name	Status	Determination: Species	Determination: Critical Habitat
Mammals				
Buena Vista Lake ornate shrew	*Sorex ornatus relictus*	Endangered	LAA	NLAA
Giant kangaroo rat*[1]	*Dipodomys ingens*	Endangered	LAA	ND
Peninsular bighorn sheep*[1,2] (PBS)	*Ovis canadensis nelsoni*	Endangered	LAA	LAA
Point Arena mountain beaver (PAMB)	*Aplodontia rufa nigra*	Endangered	LAA	ND
Salt marsh harvest mouse*[1] (SMHM)	*Reithrodontomys raviventris*	Endangered	LAA	ND
San Bernardino Merriam's kangaroo rat*[1] (SBM)	*Dipodomys merriami parvus*	Endangered	LAA	LAA
Stephens' kangaroo rat*[1]	*Dipodomys stephensi* (incl. *D. cascus)*	Threatened	LAA	ND
Tipton kangaroo rat*[1]	*Dipodomys nitratoides*	Endangered	LAA	ND
Birds				
California Ridgway's rail (also known as California clapper rail)*[1,2] (CCR)	*Rallus obsoletus*	Endangered	LAA	ND
California spotted owl, Coastal-Southern California DPS	*Strix occidentalis*	Proposed Endangered	NLJPS/LAA	ND
California spotted owl, Sierra Nevada DPS	*Strix occidentalis*	Proposed Threatened	NLJPS/LAA	ND
Coastal California gnatcatcher (CAGN)	*Polioptila californica*	Threatened	LAA	LAA
Least Bell's vireo* (LBV)	*Vireo bellii pusillus*	Endangered	LAA	LAA
Northern spotted owl*[1] (NSO)	*Strix occidentalis caurina*	Threatened	LAA	LAA
Southwestern willow flycatcher*[1]	*Empidonax traillii extimus*	Endangered	LAA	LAA
Yuma Ridgway's rail*[1,2](YRR)	*Rallus obsoletus yumanensis*	Endangered	LAA	ND
Reptiles				
Alameda whipsnake (=striped racer)*[1] (AWS)	*Masticophis lateralis euryxanthus*	Threatened	LAA	LAA
Blunt-nosed leopard lizard*[2] (BNLL)	*Gambelia silus*	Endangered	LAA	ND
Coachella Valley fringe-toed lizard*[1] (CVFTL)	*Uma inornata*	Threatened	LAA	NLAA

Species Common Name	Species Scientific Name	Status	Determination: Species	Determination: Critical Habitat
Giant garter snake*[1] (GGS)	*Thamnophis gigas*	Threatened	LAA	ND
Northwestern pond turtle (WPT)	*Actinemys marmorata*	Proposed Threatened	NLJPS/LAA	ND
San Francisco garter snake*[1,2] (SFGS)	*Thamnophis sirtalis tetrataenia*	Endangered	LAA	ND
Southwestern pond turtle (WPT)	*Actinemys pallida*	Proposed Threatened	NLJPS/LAA	ND
Amphibians				
Arroyo (arroyo Southwestern) toad (ARTO)	*Anaxyrus californicus*	Endangered	LAA	NLAA
California red-legged frog (CRLF)	*Rana draytonii*	Threatened	LAA	LAA
California tiger salamander, Central California DPS*[1] (CTS)	*Ambystoma californiense*	Threatened	LAA	LAA
California tiger salamander, Santa Barbara County DPS*[1] (CTS)	*Ambystoma californiense*	Endangered	LAA	LAA
California tiger salamander, Sonoma County DPS*[1] (CTS)	*Ambystoma californiense*	Endangered	LAA	LAA
Kern Canyon slender salamander*	*Batrachoseps simatus*	Proposed Threatened	NLJPS/LAA	Proposed - NLAA
Relictual slender salamander	*Batrachoseps relictus*	Proposed Endangered	NLJPS/LAA	Proposed - NLAA
Western spadefoot, northern DPS (WSF)	*Spea hammondii*	Proposed Threatened	NLJPS/LAA	ND
Western spadefoot, southern DPS (WSF)	*Spea hammondii*	Proposed Threatened	NLJPS/LAA	ND
Insects				
Bay checkerspot butterfly	*Euphydryas editha bayensis*	Threatened	LAA	LAA
Behren's silverspot butterfly	*Speyeria zerene behrensii*	Endangered	LAA	ND
Callippe silverspot butterfly	*Speyeria callippe*	Endangered	LAA	Proposed - No Effect/NP
Casey's June beetle (CJB)	*Dinacoma caseyi*	Endangered	LAA	NLAA
Delhi sands flower-loving fly (DSLF)	*Rhaphiomidas terminatus abdominalis*	Endangered	LAA	ND
Mission blue butterfly	*Icaricia icarioides missionensis*	Endangered	LAA	Proposed - No Effect/NP

Species Common Name	Species Scientific Name	Status	Determination: Species	Determination: Critical Habitat
Monarch butterfly (MON)	*Danaus plexippus*	Candidate	LAA	ND
Mount Herman June beetle (MHJB)	*Polyphylla barbata*	Endangered	LAA	ND
Myrtle's silverspot butterfly	*Speyeria zerene myrtleae*	Endangered	LAA	ND
Oregon silverspot butterfly	*Speyeria zerene hippolyta*	Threatened	LAA	No Effect/NP
Quino checkerspot butterfly	*Euphydryas editha quino* (=*E. e. wrighti*)	Endangered	LAA	LAA
San Bruno elfin butterfly	*Callophrys mossii bayensis*	Endangered	LAA	Proposed - No Effect/NP
Smith's blue butterfly (SBB)	*Euphilotes enoptes smithi*	Endangered	LAA	Proposed - No Effect/NP
Valley elderberry longhorn beetle (VELB)	*Desmocerus californicus dimorphus*	Threatened	LAA	No Effect/NP
Crustaceans				
Conservancy fairy shrimp	*Branchinecta conservatio*	Endangered	LAA	No Effect/NP
Longhorn fairy shrimp	*Branchinecta longiantenna*	Endangered	LAA	No Effect/NP
Riverside fairy shrimp	*Streptocephalus woottoni*	Endangered	LAA	No Effect
San Diego fairy shrimp	*Branchinecta sandiegonensis*	Endangered	LAA	NLAA
Vernal pool fairy shrimp	*Branchinecta lynchi*	Threatened	LAA	LAA
Vernal pool tadpole shrimp	*Lepidurus packardi*	Endangered	LAA	LAA
Plants				
Ash-grey paintbrush (PEBBLE)	*Castilleja cinerea*	Threatened	NLAA	LAA
Baker's larkspur*[1]	*Delphinium bakeri*	Endangered	LAA	No Effect/NP
Beach layia*[1]	*Layia carnosa*	Threatened	LAA	ND
Bear Valley sandwort	*Arenaria ursina*	Threatened	NLAA	LAA
Ben Lomond wallflower	*Erysimum teretifolium*	Endangered	LAA	ND
Butte County meadowfoam*[1]	*Limnanthes floccosa* ssp. *californica*	Endangered	LAA	LAA
California Orcutt grass*[1]	*Orcuttia californica*	Endangered	LAA	ND
Chorro Creek bog thistle*[1]	*Cirsium fontinale* var. *obispoense*	Endangered	LAA	ND
Coachella Valley milk-vetch	*Astragalus lentiginosus* var. *coachellae*	Endangered	LAA	NLAA
Colusa grass*[1]	*Neostapfia colusana*	Threatened	LAA	LAA

Species Common Name	**Species Scientific Name**	**Status**	**Determination: Species**	**Determination: Critical Habitat**
Contra Costa goldfields	*Lasthenia conjugens*	Endangered	LAA	LAA
Cushenbury buckwheat	*Eriogonum ovalifolium* var. *vineum*	Endangered	LAA	LAA
Cushenbury milk-vetch	*Astragalus albens*	Endangered	NLAA	LAA
Cushenbury oxytheca	*Oxytheca parishii* var. *goodmaniana*	Endangered	NLAA	LAA
Few-flowered navarretia*[1]	*Navarretia leucocephala* ssp. *pauciflora* (=*N. pauciflora*)	Endangered	LAA	ND
Fleshy owl's clover*[1]	*Castilleja campestris* ssp. *succulenta*	Threatened	LAA	LAA
Gentner's fritillary (GF)	*Fritillaria gentneri*	Endangered	LAA	ND
Greene's tuctoria*[1]	*Tuctoria greenei*	Endangered	LAA	LAA
Hairy Orcutt grass*[1]	*Orcuttia pilosa*	Endangered	LAA	LAA
Hoover's spurge	*Chamaesyce hooveri*	Threatened	LAA	LAA
Howell's spineflower*[1]	*Chorizanthe howellii*	Endangered	LAA	ND
Ione (incl. Irish Hill) buckwheat*[1]	*Eriogonum apricum* (incl. var. *prostratum*)	Endangered	LAA	ND
Ione manzanita	*Arctostaphylos myrtifolia*	Threatened	LAA	ND
Kern mallow	*Eremalche kernensis*	Endangered	LAA	ND
La Graciosa thistle*[1]	*Cirsium loncholepis*	Endangered	NLAA	LAA
Layne's butterweed*[1]	*Senecio layneae*	Threatened	LAA	ND
Loch Lomond coyote thistle*[1]	*Eryngium constancei*	Endangered	LAA	ND
Many-flowered navarretia*[1]	*Navarretia leucocephala* ssp. *plieantha*	Endangered	LAA	ND
Menzie's wallflower*[1]	*Erysimum menziesii*	Endangered	LAA	ND
Monterey spineflower	*Chorizanthe pungens* var. *pungens*	Threatened	LAA	LAA
Nipomo Mesa lupine*[1]	*Lupinus nipomensis*	Endangered	LAA	ND
Palmate-bracted bird's beak*[1]	*Cordylanthus palmatus*	Endangered	LAA	ND
Parish's daisy	*Erigeron parishii*	Threatened	LAA	LAA
Pedate checker-mallow (bird foot checkerbloom)* (PEBBLE)	*Sidalcea pedata*	Endangered	LAA	ND

Species Common Name	**Species Scientific Name**	**Status**	**Determination: Species**	**Determination: Critical Habitat**
Pine Hill ceanothus*[1]	*Ceanothus roderickii*	Endangered	LAA	ND
Pismo clarkia* (PISMO)	*Clarkia speciosa* ssp. *immaculata*	Endangered	LAA	ND
Sacramento Orcutt grass*[1]	*Orcuttia viscida*	Endangered	LAA	LAA
San Bernardino bluegrass (PEBBLE)	*Poa atropurpurea*	Endangered	LAA	NLAA
San Diego ambrosia	*Ambrosia pumila*	Endangered	LAA	LAA
San Diego button-celery*[1]	*Eryngium aristulatum* var. *parishii*	Endangered	LAA	ND
San Diego mesa-mint*[1]	*Pogogyne abramsii*	Endangered	LAA	ND
San Jacinto Valley crownscale	*Atriplex coronata* var. *notatior*	Endangered	LAA	ND
San Joaquin Valley Orcutt grass*[1]	*Orcuttia inaequalis*	Threatened	LAA	LAA
San Joaquin wooly-threads	*Monolopia* (=*Lembertia*) *congdonii*	Endangered	LAA	ND
Santa Clara Valley dudleya	*Dudleya setchellii*	Endangered	LAA	ND
Santa Monica Mountains dudleya (SMMD)	*Dudleya cymosa* ssp. *ovatifolia*	Threatened	LAA	ND
Slender Orcutt grass*[1]	*Orcuttia tenuis*	Threatened	LAA	LAA
Southern mountain wild-buckwheat	*Eriogonum kennedyi* var. *austromontanum*	Threatened	NLAA	LAA
Spreading navarretia	*Navarretia fossalis*	Threatened	LAA	LAA
Stebbins' morning-glory*[1]	*Calystegia stebbinsii*	Endangered	LAA	ND
Thread-leaved brodiaea*	*Brodiaea filifolia*	Threatened	LAA	No Effect
Vandenberg monkeyflower	*Diplacus vandenbergensis*	Endangered	NLAA	LAA
Ventura Marsh milk-vetch*	*Astragalus pycnostachyus* var. *lanosissimus*	Endangered	NLAA	LAA
Yadon's piperia	*Piperia yadonii*	Endangered	NLAA	LAA
Yellow larkspur*	*Delphinium luteum*	Endangered	NLAA	LAA

Table 2. Covered species and critical habitats addressed in the PLOC (i.e., NLAA species or critical habitats based on Caltrans' determinations).

Species Common Name	Species Scientific Name	Status	Determination: Species	Determination: Critical Habitat
Mammals				
Buena Vista Lake ornate shrew	*Sorex ornatus relictus*	Endangered	LAA	NLAA
Fisher, Southern Sierra Nevada DPS* (FISHER)	*Pekania pennanti*	Endangered	NLAA	Proposed - NLAA
Gray wolf*	*Canis lupus*	Endangered	NLAA	No Effect/NP
Pacific marten, coastal DPS* (PACMAR)	*Martes caurina*	Threatened	NLAA	Proposed - NLAA
Pacific pocket mouse	*Perognathus longimembris pacificus*	Endangered	NLAA	ND
Riparian brush rabbit*	*Sylvilagus bachmani riparius*	Endangered	NLAA	ND
Riparian woodrat (=San Joaquin Valley)	*Neotoma fuscipes riparia*	Endangered	NLAA	ND
San Joaquin kit fox*	*Vulpes macrotis mutica*	Endangered	NLAA	ND
Birds				
California condor*[2] (COND)	*Gymnogyps californianus*	Endangered	NLAA	NLAA
California least tern*[2]	*Sterna antillarum browni*	Endangered	NLAA	ND
Light-footed (Ridgway's) clapper rail*[2] (LFR)	*Rallus longirostris levipes*	Endangered	NLAA	ND
Marbled murrelet* (MAMU)	*Brachyramphus marmoratus*	Threatened	NLAA	NLAA
Western snowy plover, Pacific Coast DPS (WSP)	*Charadrius nivosus*	Threatened	NLAA	NLAA
Yellow-billed cuckoo, Western US DPS*	*Coccyzus americanus*	Threatened	NLAA	NLAA
Reptiles				
Coachella Valley fringe-toed lizard*[1] (CVFTL)	*Uma inornata*	Threatened	LAA	NLAA
Amphibians				
Arroyo (arroyo Southwestern) toad (ARTO)	*Anaxyrus californicus*	Endangered	LAA	NLAA
Foothill yellow-legged frog, Central Coast DPS*	*Rana boylii*	Threatened	NLAA	ND
Foothill yellow-legged frog, North Feather DPS*	*Rana boylii*	Threatened	NLAA	ND
Foothill yellow-legged frog, South Coast DPS*	*Rana boylii*	Endangered	NLAA	ND
Foothill yellow-legged frog, South Sierra DPS*	*Rana boylii*	Endangered	NLAA	ND

Species Common Name	Species Scientific Name	Status	Determination: Species	Determination: Critical Habitat
Kern Canyon slender salamander*	*Batrachoseps simatus*	Proposed Threatened	NLJPS/LAA	Proposed - NLAA
Mountain yellow-legged frog, Southern California DPS*	*Rana muscosa*	Endangered	NLAA	No Effect/NP
Relictual slender salamander	*Batrachoseps relictus*	Proposed Endangered	NLJPS/LAA	Proposed - NLAA
Santa Cruz long-toed salamander*[2]	*Ambystoma macrodactylum croceum*	Endangered	NLAA	No Effect/NP
Sierra Nevada yellow-legged frog*	*Rana sierrae*	Endangered	NLAA	NLAA
Yosemite toad (YOTO)	*Anaxyrus canorus*	Threatened	NLAA	No Effect/NP
Fishes				
Delta smelt*	*Hypomesus transpacificus*	Threatened	NLAA	NLAA
Lahontan cutthroat trout	*Oncorhynchus clarkii henshawi*	Threatened	NLAA	ND
Longfin smelt*	*Spirinchus thaleichthys*	Proposed Endangered	NLJPS/NLAA	ND
Razorback sucker*[2]	*Xyrauchen texanus*	Endangered	NLAA	No Effect
Santa Ana sucker	*Catostomus santaanae*	Threatened	NLAA	NLAA
Tidewater goby	*Eucyclogobius newberryi*	Endangered	NLAA	No Effect
Unarmored threespine stickleback*	*Gasterosteus aculeatus williamsoni*	Endangered	NLAA	Proposed - No Effect/NP
Snails				
Morro shoulderband snail	*Helminthoglypta walkeriana*	Threatened	NLAA	No Effect/NP
Insects				
Carson wandering skipper	*Pseudocopaeodes eunus obscurus*	Endangered	NLAA	ND
Casey's June beetle (CJB)	*Dinacoma caseyi*	Endangered	LAA	NLAA
El Segundo blue butterfly	*Euphilotes battoides allyni*	Endangered	NLAA	Proposed – No Effect/NP
Hermes copper butterfly (HERMES)	*Lycaena hermes*	Threatened	NLAA	NLAA
Kern primrose sphinx moth	*Euproserpinus euterpe*	Threatened	NLAA	ND
Zayante band-winged grasshopper	*Trimerotropis infantilis*	Endangered	No Effect	NLAA

Species Common Name	Species Scientific Name	Status	Determination: Species	Determination: Critical Habitat
Crustaceans				
San Diego fairy shrimp	*Branchinecta sandiegonensis*	Endangered	LAA	NLAA
Conifers and Cycads				
Santa Cruz cypress*	*Pinus albicaulis*	Threatened	NLAA	ND
Plants				
Ash-grey paintbrush (PEBBLE)	*Castilleja cinerea*	Threatened	NLAA	LAA
Bakersfield cactus*	*Opuntia treleasei*	Endangered	NLAA	ND
Bear Valley sandwort	*Arenaria ursina*	Threatened	NLAA	LAA
Ben Lomond spineflower	*Chorizanthe pungens* var. *hartwegiana*	Endangered	NLAA	ND
Braunton's milk-vetch	*Astragalus brauntonii*	Endangered	NLAA	NE
California jewelflower*	*Caulanthus californicus*	Endangered	NLAA	ND
California taraxacum (PEBBLE)	*Taraxacum californicum*	Endangered	NLAA	NLAA
Chinese camp brodiaea*	*Brodiaea pallida*	Threatened	NLAA	ND
Clara Hunt's milk-vetch*	*Astragalus clarianus*	Endangered	NLAA	ND
Coastal dunes milk-vetch*	*Astragalus tener* var. *titi*	Endangered	NLAA	ND
Coachella Valley milk-vetch	*Astragalus lentiginosus* var. *coachellae*	Endangered	LAA	NLAA
Cushenbury milk-vetch	*Astragalus albens*	Endangered	NLAA	LAA
Cushenbury oxytheca	*Oxytheca parishii* var. *goodmaniana*	Endangered	NLAA	LAA
Del Mar manzanita	*Arctostaphylos glandulosa* ssp. *crassifolia*	Endangered	NLAA	ND
El Dorado bedstraw*	*Galium californicum* ssp. *Sierrae*	Endangered	NLAA	ND
Encinitas baccharis*	*Baccharis vanessae*	Threatened	NLAA	ND
Fish Slough milk-vetch	*Astragalus lentiginosus* var. *piscinensis*	Threatened	NLAA	No Effect/NP
Fountain thistle*	*Cirsium fontinale* var. *fontinales*	Endangered	NLAA	ND
Franciscan manzanita	*Arctostaphylos franciscana*	Endangered	No Effect	NLAA
Gambel's watercress*	*Rorippa gambellii*	Endangered	NLAA	ND
Hartweg's golden sunburst*	*Pseudobahia bahiifolia*	Endangered	NLAA	ND
Hickman's potentilla (cinquefoil)*	*Potentilla hickmanii*	Endangered	NLAA	ND

Species Common Name	Species Scientific Name	Status	Determination: Species	Determination: Critical Habitat
Keck's checker-mallow	*Sidalcea keckii*	Endangered	NLAA	No Effect/NP
La Graciosa thistle*[1]	*Cirsium loncholepis*	Endangered	NLAA	LAA
Laguna Beach liveforever	*Dudleya stolonifera*	Threatened	NLAA	ND
Lake County stonecrop*	*Parvisedum leiocarpum*	Endangered	NLAA	ND
Large-flowered fiddleneck*	*Amsinckia grandiflora*	Endangered	NLAA	No Effect/NP
Marin dwarf-flax*	*Hesperolinon congestum*	Threatened	NLAA	ND
Marsh sandwort* (MARSH)	*Arenaria paludicola*	Endangered	NLAA	ND
Metcalf Canyon jewel-flower	*Streptanthus albidus* ssp. *albidus*	Endangered	NLAA	ND
Monterey clover*	*Trifolium trichocalyx*	Endangered	NLAA	ND
Monterey gilia*	*Gilia tenuiflora* ssp. *arenaria*	Endangered	NLAA	ND
Munz's onion*	*Allium munzii*	Endangered	NLAA	No Effect/NP
Nevin's barberry*	*Berberis nevinii*	Endangered	NLAA	No Effect
Orcutt's spineflower*	*Chorizanthe orcuttiana*	Endangered	NLAA	ND
Otay tarplant*	*Deinandra* (=*Hemizonia*) *conjugens*	Threatened	NLAA	No Effect
Peirson's milk-vetch*	*Astragalus magdalenae* var. *peirsonii*	Threatened	NLAA	NLAA
Pine Hill flannelbush*	*Fremontodendron californicum* ssp. *decumbens*	Endangered	NLAA	ND
Red Hills vervain*	*Verbena californica*	Threatened	NLAA	ND
Robust spineflower	*Chorizanthe robusta* var. *robusta*	Endangered	NLAA	NLAA
Salt marsh bird's-beak*	*Cordylanthus maritimus* ssp. *maritimus*	Endangered	NLAA	ND
San Diego thornmint*	*Acanthomintha ilicifolia*	Threatened	NLAA	No Effect
San Bernardino bluegrass	*Poa atropurpurea*	Endangered	LAA	NLAA
San Francisco lessingia*	*Lessingia germanorum* (=*L.g.* var. *germanorum*)	Endangered	NLAA	ND
San Joaquin adobe sunburst*	*Pseudobahia peirsonii*	Threatened	NLAA	ND
Santa Ana River woollystar *	*Eriastrum densifolium* ssp. *sanctorum*	Endangered	NLAA	ND
Santa Cruz tarplant*	*Holocarpha macradenia*	Threatened	NLAA	NLAA

Species Common Name	Species Scientific Name	Status	Determination: Species	Determination: Critical Habitat
Showy Indian clover	*Trifolium amoenum*	Endangered	NLAA	ND
Slender-horned spineflower*	*Dodecahema leptoceras*	Endangered	NLAA	ND
Slender-petaled mustard (thelypodium)* (PEBBLE)	*Thelypodium stenopetalum*	Endangered	NLAA	ND
Southern mountain wild-buckwheat	*Eriogonum kennedyi* var. *austromontanum*	Threatened	NLAA	LAA
Springville clarkia*	*Clarkia springvillensis*	Threatened	NLAA	ND
Tiburon paintbrush*	*Castilleja affinis* ssp. *neglecta*	Endangered	NLAA	ND
Triple-ribbed milk-vetch	*Astragalus tricarinatus*	Endangered	NLAA	ND
Vandenberg monkeyflower	*Diplacus vandenbergensis*	Endangered	NLAA	LAA
Ventura Marsh milk-vetch*	*Astragalus pycnostachyus* var. *lanosissimus*	Endangered	NLAA	LAA
Verity’s dudleya	*Dudleya verity*	Threatened	NLAA	ND
Vine Hill clarkia*	*Clarkia imbricata*	Endangered	NLAA	ND
Webber's ivesia	*Ivesia webberi*	Threatened	NLAA	NLAA
White sedge*	*Carex albida*	Endangered	NLAA	ND
Willowy monardella*	*Monardella viminea*	Endangered	NLAA	No Effect/NP
Yadon’s piperia	*Piperia yadonii*	Endangered	NLAA	LAA
Yellow larkspur*	*Delphinium luteum*	Endangered	NLAA	LAA
Yreka phlox* (PHLOX)	*Phlox hirsute*	Endangered	NLAA	ND

NOTES FOR TABLES 1 AND 2:

DPS = Distinct Population Segment
LAA = may affect, likely to adversely affect (i.e., covered species/critical habitats addressed in the PBO)
NLAA = may affect, not likely to adversely affect (i.e., species/critical habitats addressed in the PLOC)
NLJPS = not likely to jeopardize the continued existence of the proposed species
ND = critical habitat not proposed or designated for species
No Effect/NP = critical habitat designated or proposed, but Action Area does not overlap critical habitat boundary

* Species jointly listed under the Act and the California Endangered Species Act (CESA).
[1] Species that could be included in a future Consistency Determination with California Department of Fish and Wildlife.
[2] Species that are also classified as Fully Protected under Fish and Game Code Sections 3511, 4733, 5050, and 5515. Caltrans has designed the project such that handling, capture, and relocation are not included as part of the proposed action.

AUTHORITIES AND DISCRETION

California Senate Bill (SB) 156 designated the California Department of Technology (CDT) as the state entity responsible for the MMBN, including planning, design, construction, maintenance, and operation. The state Budget Act of 2021 provided CDT with the funding for the MMBN. To support CDT's delivery of the MMBN, SB 156 assigned Caltrans the responsibility to construct or approve construction of the MMBN.

Lead Federal Agency Designation

Under agreement with FHWA, Caltrans performs federal responsibilities for environmental decisions and approvals (e.g., consultation under section 7(a)(2) of the Act) as defined under the National Environmental Policy Act (NEPA). These responsibilities have been assigned to Caltrans by FHWA under two memoranda of understanding (MOU) signed by FHWA for 23 United States Code (USC) 326 and 23 USC 327 on April 18, 2022, and May 27, 2022, respectively. This PBO and PLOC applies to Caltrans' actions related to MMBN assignable under 23 USC 326, as well as any applicable FHWA actions. For example, installation of broadband within highway rights-of-way constitutes an alternative non-highway use of federal-aid rights-of-way. Accordingly, FHWA must approve the non-highway use through a right-of-way Use Agreement in accordance with 23 CFR 710.405.

For FHWA and Caltrans, approval of the non-highway use of the ROW, through a ROW Use Agreement, triggers NEPA. Under 23 USC 326 (Categorical Exclusion (CE) assignment) Caltrans is authorized to perform NEPA work in certain circumstances and is deemed a Federal agency acting on behalf of FHWA, making Caltrans solely responsible and liable for NEPA compliance (including federal responsibilities for environmental decisions and approvals such as consultation under section 7(a)(2) of the Act). For MMBN projects that meet the criteria for a CE under the most recent 23 USC 326 MOU, Caltrans may perform the NEPA (and consultation) work. FHWA will remain the NEPA Lead Agency (and lead for consultation) for projects analyzed under Environmental Assessments or Environmental Impact Statements.

While 23 USC 326 defines NEPA Lead Agency status for Caltrans and FHWA, in practice all work conducted on the MMBN project described in the PLOC and PBO will go through environmental review with Caltrans due to their authority over the SHS. Throughout the PLOC and PBO we refer to Caltrans as the lead agency authorizing or implementing the MMBN project, with the understanding that, pursuant to the discussion above, FHWA may make specific approvals for some MMBN projects and also has a role in section 7(a)(2) compliance.

Designation by Other Federal Agencies

The following federal agencies that may have actions related to MMBN that require section 7(a)(2) compliance (e.g., the MMBN project would occur within Caltrans' right-of-way on land under the jurisdiction of a federal land management agency) coordinated with Caltrans to develop the PBA and designated Caltrans/FHWA as lead agency for purposes of section 7(a)(2) consultation (50 CFR 402.07):

- Army Corps of Engineers
- Army Garrison Presidio of Monterey
- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Reclamation
- Department of the Army
- Department of the Navy
- Fish and Wildlife Service
- Marine Corps Installations Command–West
- National Guard
- National Park Service

If a federal agency not listed above proposes an action that is consistent with the analysis contained in this PBO or PLOC, the federal agency may contact the Service and request a streamlined consultation to meet its consultation obligations under section 7(a)(2) of the Act.

Use of other Programmatic Biological Opinions

Caltrans will use the Biological Opinion for Routine Highway Improvements, Maintenance Activities, and Safety Projects in Imperial, Inyo, Kern, Los Angeles, Riverside, San Bernardino, and San Diego Counties, California (desert tortoise PBO; Service 2021) for MMBN projects which may affect the desert tortoise. MMBN projects will follow all procedures described in the desert tortoise PBO. Caltrans will track take of desert tortoise due to MMBN projects using the desert tortoise PBO only.

Consistency with the California Endangered Species Act

Caltrans has the authority to work with the California Department of Fish and Wildlife (CDFW) on environmental compliance for species listed under the Act that are also listed under the California Endangered Species Act (CESA) (i.e., dually-listed species). While compliance with CESA is beyond the authority of the Service, this PBO may be referenced during discussions between CDFW and Caltrans (e.g., for consistency determinations under Fish and Game Code 2081.1).

PROGRAMMATIC LETTER OF CONCURRENCE
AND INFORMAL CONFERENCE

Administration of the PLOC

The Administration of the PBO section of the accompanying PBO describes project review processes, monitoring and reporting requirements, and other administrative details that also apply to this PLOC.

Not Likely to Adversely Affect Determinations

Caltrans' July 7, 2023, request for consultation included determinations that the proposed action may affect but is not likely to adversely affect 94 listed species, 22 designated critical habitats, 1 proposed species, and 4 proposed critical habitats (Table 2). Caltrans provided a description of potential adverse effects of the project on these species and critical habitats, and conservation measures to avoid or minimize those adverse effects in Section 2.4 of the PBA (Caltrans 2023) (Table 3).

Conclusion for NLAA Species and Critical Habitats

We concur with Caltrans' determination that the proposed action may affect but is not likely to adversely affect the species and critical habitats listed as NLAA in Table 2.

Our concurrence is based on the effects of the action to individual species and critical habitats described in Chapter 4 of the PBA (Caltrans 2023) and summarized in Table 3, below. Where appropriate, the analysis in Table 3 is grouped by niche or guild (e.g., forest mammals) because we anticipate that species with shared ecology, habitat specificity, or similar life history traits which substantially overlap in time and space would be similarly affected by project activities in shared habitats.

Our concurrence is additionally based on Caltrans' commitment to implement conservation measures BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitat; and BIO-2: Covered Species-Specific Surveys. Implementation of BIO-1 and BIO-2 will determine if the species and critical habitats listed in Table 2 are present prior to implementing project-related activities. After implementing BIO-1 and BIO-2, if species or critical habitats are present, or are presumed present onsite, then Caltrans will implement all appropriate general and species-specific conservation measures identified in Table 3 for corresponding species and critical habitats to avoid or minimize potential adverse effects such that exposure to the potential adverse effects is discountable, or the response to the adverse effects is insignificant.

According to the Service's Consultation Handbook, "discountable effects are those extremely unlikely to occur. Based on best judgement a person would not…(2) expect discountable effects to occur" (Service 1998). Insignificant effects "relate to the size of the impact and should never reach the scale where take occurs…Based on best judgement, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects;…" (Services 1998).

Although our concurrence ends informal consultation for the species and critical habitats listed in Table 2, obligations under section 7(a)(2) of the Act will be reconsidered for these species and critical habitats if new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered, or this action is subsequently modified in a manner that was not considered in this assessment. For example, our concurrence with Caltrans' determination that the proposed action is not likely to adversely affect the species and critical habitats listed in Table 2 was based on an analysis that included Caltrans fully implementing the general and category 1 conservation measures as described in the Conservation Measures section of the PBO. If Caltrans fails to implement these measures as described, the project may be considered modified in a manner not considered in the assessment and could result in effects to listed species or critical habitats in a manner or to an extent not previously considered. If the proposed action changes in any manner or if new information reveals the presence of additional listed, proposed, or candidate species in the project area, Caltrans should contact the Service immediately for further consultation.

Table 3. Anticipated effects of the proposed action on NLAA species and critical habitats with the conservation measures that Caltrans will implement to avoid or minimize adverse effects. Species are grouped by similar life history (if applicable).

Species	Effects of the Action	Conservation Measures
Forest Mammals Fisher Gray wolf Pacific marten	Project construction activities could result in removal of vegetation and snags used by the species. Operation of heavy equipment could result in a vehicle strike that causes injury or mortality, and could increase noise or vibration that could impair essential behaviors, including foraging and breeding. Excavation, including conduit and vault installation, could trap and confine individuals to excavated areas with no escape, which may expose individuals to predation, increase stress, and impair essential behaviors. Exposure to these effects is discountable due to the implementation of Category 1 measures that will avoid suitable habitat and burrows/dens and implement a 200-foot exclusion buffer around suitable habitat. The presence of biological monitoring and daily clearance surveys will further ensure avoidance, and Caltrans will also avoid the removal of snags and other habitat used by the species.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-12 (*Protections for Species and their Habitat*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) BIO-15 (*Prevent Species Entrapment*) BIO-16 (*Wildlife Exclusion Fencing for Stationary Work Sites*) <u>Category 1</u> MAM-1 (*Seasonal Mammalian Work Windows*) MAM-2 (*Pre-Construction Mammalian Surveys*) MAM-3 (*Suitable Habitat and Burrow Exclusion Buffers*) MAM-4 (*Biological Monitor and Daily Clearance Surveys*) FISHER/PACMAR-1 (*Avoid Removal of Important Habitat Structures for Fisher and Pacific Martin*)

Species	Effects of the Action	Conservation Measures
Pacific pocket mouse	Construction activity including conduit and vault installation could remove vegetation or disturb soil, resulting in increased erosion and sedimentation that degrades suitable habitat, or buries or entombs individuals or their burrows. Operation of heavy equipment could result in a vehicle strike that causes injury or mortality, and or could increase noise and vibration that could impair essential behaviors, including foraging and breeding. Excavation, including conduit and vault installation, could trap and confine individuals to excavated areas with no escape, which may expose individuals to predation, increase stress, and impair essential behaviors. Exposure to these effects is discountable due to the implementation of Category 1 measures that will avoid suitable habitat and burrows/dens and implement a 200-foot exclusion buffer around suitable burrows. The presence of biological monitoring and daily clearance surveys will further ensure avoidance.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-12 (*Protections for Species and their Habitat*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) BIO-14 (*Maintenance, Staging, and Storage of Equipment*) BIO-15 (*Prevent Species Entrapment*) BIO-16 (*Wildlife Exclusion Fencing for Stationary Work Sites*) <u>Category 1</u> MAM-2 (*Pre-Construction Mammalian Surveys*) MAM-3 (*Suitable Habitat and Burrow Exclusion Buffers*) MAM-4 (*Biological Monitor and Daily Clearance Surveys*) MAM-5 (*Biological Escort*) MAM-6 (*Rain Limitations*)

Species	Effects of the Action	Conservation Measures
Riparian Mammals Riparian brush rabbit Riparian woodrat	Construction activity including conduit and vault installation could remove vegetation or disturb soil, resulting in increased erosion and sedimentation that degrades suitable habitat, or buries individuals or their burrows. Operation of heavy equipment could result in a vehicle strike that causes injury or mortality, and or could increase noise and vibration that could impair essential behaviors, including foraging and breeding. Excavation, including conduit and vault installation, could trap and confine individuals to excavated areas with no escape, which may expose individuals to predation, increase stress, and impair essential behaviors. Exposure to these effects is discountable due to the implementation of Category 1 measures that will avoid suitable habitat and burrows/dens, and require the establishment of a 100-foot exclusion buffer. The presence of biological monitoring and daily clearance surveys will further ensure avoidance. Implementation of conservation measures will reduce the potential for stressors to result in adverse responses from individuals.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-12 (*Protections for Species and their Habitat*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) BIO-14 (*Maintenance, Staging, and Storage of Equipment*) BIO-15 (*Prevent Species Entrapment*) BIO-16 (*Wildlife Exclusion Fencing for Stationary Work Sites*) <u>Category 1</u> MAM-2 (*Pre-Construction Mammalian Surveys*) MAM-3 (*Suitable Habitat and Burrow Exclusion Buffers*) MAM-4 (*Biological Monitor and Daily Clearance Surveys*) MAM-6 (*Rain Limitations*)

Species	Effects of the Action	Conservation Measures
San Joaquin kit fox	Construction activity including conduit and vault installation could remove vegetation or disturb soil, resulting in increased erosion and sedimentation that degrades suitable habitat, or buries individuals or their burrows. Operation of heavy equipment could result in a vehicle strike that cause injury or mortality, and or could increase noise and vibration that could impair essential behaviors, including foraging and breeding. Excavation, including conduit and vault installation, could trap and confine individuals to excavated areas with no escape, which may expose individuals to predation, increase stress, and impair essential behaviors. Exposure to these effects is discountable due to the implementation of Category 1 measures that will a avoid suitable habitat and burrows/dens and require exclusion buffers of 50 feet for potential dens, 100 feet for known dens, or 200 feet for natal dens. This species is already habituated to high road noise and visual disturbance in the area; implementation of the work windows and buffers will ensure the project does not significantly increase these conditions. The presence of biological monitoring and daily clearance surveys will further ensure avoidance. Implementation of conservation measures will ensure that responses to stressors are insignificant.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-12 (*Protections for Species and their Habitat*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) BIO-14 (*Maintenance, Staging, and Storage of Equipment*) BIO-15 (*Prevent Species Entrapment*) BIO-16 (*Wildlife Exclusion Fencing for Stationary Work Sites*) <u>Category 1</u> MAM-1 (*Seasonal Mammalian Work Windows*) MAM-2 (*Pre-Construction Mammalian Surveys*) MAM-3 (*Suitable Habitat and Burrow Exclusion*) MAM-4 (*Biological Monitor and Daily Clearance Surveys*) MAM-6 (*Rain Limitations*)

Species	Effects of the Action	Conservation Measures
Mammal CH Buena Vista Lake ornate shrew Fisher Pacific marten	Project construction activities that result in ground disturbance or vegetation removal including conduit and vault installation could result in the physical loss of designated critical habitat or adverse effects on PBFs if those habitats or PBFs are present. Effects on these designated critical habitats and their PBFs will be avoided and minimized through the implementation of Category 1 measures. Caltrans will avoid installation of permanent infrastructure such as vaults and MVPs in areas with PBFs within designated critical habitat. Temporary disturbance in areas with PBFs within designated critical habitat will be restored. Any PBFs that cannot be restored will be completely avoided. Implementation of conservation measures will reduce the potential for stressors to result in adverse effects to the conservation values of these critical habitats. Implementation of all General and Category 1 measures will ensure effects are insignificant or discountable.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) <u>Category 1</u> MAM-3 (*Suitable Habitat and Burrow Exclusion*) FISHER/PACMAR-1 (*Avoid Removal of Important Habitat Structures for Fisher and Pacific Martin*)
California condor	Construction activity including conduit and vault installation could result in removal of vegetation or soil disturbance that results in nest removal, reduced productivity, and degradation of suitable habitat. Operation of heavy equipment could result in a vehicle strike that causes injury or mortality, and or could increase noise and vibration, or increase visual impacts that could impair essential behaviors, including nesting, foraging, and breeding. While the project occurs within the range of California condor, the project activities are not anticipated to occur in habitat used by the species and if suitable habitat is encountered it will be avoided. Exposure to adverse effects is discountable due to the implementation of Category 1 measures.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-10 (*Nesting Bird* Surveys) BIO-12 (*Protections for Species and their Habitat*) <u>Category 1</u> COND-1 (*Conduit Installation Method Restrictions in California Condor Habitat*)

Species	Effects of the Action	Conservation Measures
Shorebirds California least tern Western snowy plover	Construction activity including conduit and vault installation could result in removal of vegetation or soil disturbance that results in nest removal, reduced productivity, and degradation of suitable habitat. Operation of heavy equipment could result in a vehicle strike that causes injury or mortality, and or could increase noise and vibration, or increase visual impacts that could impair essential behaviors, including nesting, foraging, and breeding. Exposure to these effects is discountable due to the implementation of General and Category 1 measures that will apply work windows and exclusion buffers to ensure that the species will not be impacted. Because both species are year-round residents, species-specific conservation measures will be implemented to avoid impacts during the winter non-breeding season. For the western snowy plover population at Silver Strand Beach, measure WSP-2 will ensure avoidance of this critical population that is known to occur near the highway.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-10 (*Nesting Bird* Surveys) BIO-12 (*Protections for Species and their Habitat*) <u>Category 1</u> BIRD-1 (*Seasonal Avian Work Windows*) WSP-1 (*Western Snowy Plover Pre-construction Surveys during Non-Breeding Season*) WSP-2 (*Protect Wintering Western Snowy Plover Habitat at Silver Strand Beach*)

Species	Effects of the Action	Conservation Measures
Light-footed Ridgway's rail	Construction activity including conduit and vault installation could result in removal of vegetation or soil disturbance that results in nest removal, reduced productivity, and degradation of suitable habitat. Operation of heavy equipment could result in a vehicle strike that causes injury or mortality, and/or could increase noise and vibration that could impair essential behaviors, including foraging and breeding. Implementation of Category 1 measures will ensure that adverse effects from implementing biological surveys are insignificant, and active avoidance of any identified individuals will ensure that adverse effects from project activities are discountable.	General BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-10 (*Nesting Bird* Surveys) BIO-12 (*Protections for Species and their Habitat*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) Category 1 BIRD-1 (*Seasonal Avian Work Windows*) CCR/LFR/YRR-1 (*Pre-construction California Clapper Rail, Light-footed Ridgway's Rail, and Yuma Ridgway's Rail Surveys During Non-Breeding Season*) CCR/LFR/YRR-2 (*Avoidance Buffer for Suitable California Clapper Rail, Light-footed Ridgway's Rail, and Yuma Ridgway's Rail Habitat During Non-Breeding Season*) CCR/LFR/YYR-3 (*Biological Monitor and Daily Pre-construction California Clapper Rail, Light-footed Ridgway's Rail, and Yuma Ridgway's Rail Surveys During Non-Breeding Season*) CCR/LFR-1 (*Avoid Work at High Tides in California Clapper Rail and Light-footed Ridgway's Rail Habitat Year-Round*)

Species	Effects of the Action	Conservation Measures
Marbled murrelet	Construction activity including conduit and vault installation could result in removal of vegetation or soil disturbance that results in nest removal, reduced productivity, and degradation of suitable habitat. Operation of heavy equipment could result in a vehicle strike that causes injury or mortality, and or could increase noise and vibration, or increase visual impacts that could impair essential behaviors, including nesting, foraging, and breeding. Exposure to these effects is discountable due to the implementation of General and Category 1 measures that will apply work windows and exclusion buffers to ensure that the species will not be impacted. Implementation of species-specific conservation measures will ensure that known or potential nest trees are not removed at any time of the year.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-10 (*Nesting Bird* Surveys) BIO-12 (*Protections for Species and their Habitat*) <u>Category 1</u> BIRD-1 (*Seasonal Avian Work Windows*) MAMU-1 (*Prohibit Removal of Known or Potential Marbled Murrelet Nest Trees*)
Yellow-billed Cuckoo	Construction activity including conduit and vault installation could result in removal of vegetation or soil disturbance that results in nest removal, reduced productivity, and degradation of suitable habitat. Operation of heavy equipment could result in a vehicle strike that causes injury or mortality, and or could increase noise and vibration, or increase visual impacts that could impair essential behaviors, including nesting, foraging, and breeding. Exposure to these effects is discountable due to the implementation of Category 1 measures that will avoid work during the nesting season.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-10 (*Nesting Bird* Surveys) BIO-12 (*Protections for Species and their Habitat*) <u>Category 1</u> BIRD-1 (*Seasonal Avian Work Windows*)

Species	Effects of the Action	Conservation Measures
Bird CH California condor Marbled murrelet Western snowy plover Yellow-billed cuckoo	Construction activities that result in ground disturbance or vegetation removal including conduit and vault installation could result in the physical loss of designated critical habitat or adverse effects on PBFs if those habitats or PBFs are present. Effects on these designated critical habitats and their PBFs will be avoided and minimized through the implementation of General and Category 1 measures. Caltrans will avoid installation of permanent infrastructure such as vaults and MVPs in areas with PBFs within designated critical habitat. Temporary disturbance in areas with PBFs within designated critical habitat will be restored. Any PBFs that cannot be restored will be avoided. Implementation of conservation measures will ensure that responses to stressors are insignificant to the conservation values of these critical habitats. Implementation of all General and Category 1 measures will ensure adverse effects are insignificant or discountable.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) <u>Category 1</u> MAMU-1 (*Prohibit Removal of Known or Potential Marbled Murrelet Nest Trees*)

Species	Effects of the Action	Conservation Measures
Reptile CH Coachella Valley fringe-toed lizard	Project construction activities that result in ground disturbance or vegetation removal including conduit and vault installation could result in the physical loss of designated critical habitat or adverse effects on PBFs if those habitats or PBFs are present. Effects on this designated critical habitat and its PBFs will be avoided and minimized through the implementation of General measures. Caltrans will avoid installation of permanent infrastructure such as vaults and MVPs in areas with PBFs within designated critical habitat. Temporary disturbance in areas with PBFs within designated critical habitat will be restored. Any PBFs that cannot be restored will be avoided. Implementation of conservation measures will ensure that responses to stressors are insignificant. to the conservation values of this critical habitats. Implementation of all General measures will ensure adverse effects are insignificant or discountable.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*)

Species	Effects of the Action	Conservation Measures
Highly Aquatic Frogs Foothill yellow-legged frog, Central Coast DPS Foothill yellow-legged frog, North Feather DPS Foothill yellow-legged frog, South Coast DPS Foothill yellow-legged frog, South Sierra DPS Mountain yellow-legged frog, Southern California DPS Sierra Nevada yellow-legged frog	Construction activity including conduit and vault installation could remove vegetation or disturb soil, resulting in changes in water quality, changes in dispersal patterns, increased erosion and sedimentation that degrades suitable habitat, or buries, crushes, or entombs individuals or their burrows. Operation of heavy equipment could result in a vehicle strike that causes injury or mortality, and or could increase noise and vibration, that could impair essential behaviors, including foraging and breeding, or could introduce hazardous materials that degrade habitat or harm individuals, or could change air quality which could harm individuals. Excavation, including conduit and vault installation, could change topography and hydrology, and introduce invasive competitors or disease that degrades suitable habitat, which may expose individuals to predation, increase stress, and impair essential behaviors. Exposure to these effects is insignificant or discountable due to the implementation of General and Category 1 measures that will avoid direct and indirect impacts to suitable aquatic habitat, avoid burrowing habitat, and exclude individuals from active construction sites. The presence of biological monitoring and daily clearance surveys will further avoid or minimize effects of project activities.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-12 (*Protections for Species and their Habitat*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) BIO-14 (*Maintenance, Staging, and Storage of Equipment*) BIO-15 (*Prevent Species Entrapment*) BIO-16 (*Wildlife Exclusion Fencing for Stationary Work Sites*) <u>Category 1</u> AMPH-1 (*Seasonal Amphibian Work Windows*) AMPH-2 (*Pre-Construction Amphibian Surveys*) AMPH-3 (*Biological Monitor and Daily Clearance Surveys*) AMPH-4 (*Amphibian Aquatic Habitat Avoidance and Minimization Buffer*) AMPH-5 (*Rain Limitations*)

Species	Effects of the Action	Conservation Measures
Yosemite toad	Construction activity including conduit and vault installation could remove vegetation or disturb soil, resulting in changes in water quality, changes in dispersal patterns, increased erosion and sedimentation that degrades suitable habitat, or buries, crushes, or entombs individuals or their burrows. Operation of heavy equipment could result in a vehicle strike that causes injury or mortality, and or could increase noise and vibration, that could impair essential behaviors, including foraging and breeding, or could introduce hazardous materials that degrade habitat or harm individuals, or could change air quality which could harm individuals. Excavation, including conduit and vault installation, could change topography and hydrology, and introduce invasive competitors or disease that degrades suitable habitat, which may expose individuals to predation, increase stress, and impair essential behaviors. Exposure to these effects is insignificant or discountable due to the implementation of General and Category 1 measures that will avoid direct and indirect impacts to suitable aquatic habitat, avoid burrowing habitat, and exclude individuals from active construction sites. The presence of biological monitoring and daily clearance surveys will further avoid or minimize effects of project activities.	General BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-12 (*Protections for Species and their Habitat*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) BIO-14 (*Maintenance, Staging, and Storage of Equipment*) BIO-15 (*Prevent Species Entrapment*) BIO-16 (*Wildlife Exclusion Fencing for Stationary Work Sites*) Category 1 AMPH-1 (*Seasonal Amphibian Work Windows*) AMPH-2 (*Pre-Construction Amphibian Surveys*) AMPH-3 (*Biological Monitor and Daily Clearance Surveys*) AMPH-4 (*Amphibian Aquatic Habitat Avoidance and Minimization Buffer*) AMPH-5 (*Rain Limitations*) YOTO-1 (*Yosemite Toad Lupine Area Avoidance*)

Species	Effects of the Action	Conservation Measures
Santa Cruz long-toed salamander	Construction activity including conduit and vault installation could remove vegetation or disturb soil, resulting in changes in water quality, changes in dispersal patterns, increased erosion and sedimentation that degrades suitable habitat, or buries, crushes, or entombs individuals or their burrows. Operation of heavy equipment could result in a vehicle strike that causes injury or mortality, and or could increase noise and vibration, that could impair essential behaviors, including foraging and breeding, or could introduce hazardous materials that degrade habitat or harm individuals, or could change air quality which could harm individuals. Excavation, including conduit and vault installation, could change topography and hydrology, and introduce invasive competitors or disease that degrades suitable habitat, which may expose individuals to predation, increase stress, and impair essential behaviors. Exposure to these effects is insignificant or discountable due to the implementation of General and Category 1 measures that will create habitat avoidance buffers and active avoidance of any individuals identified during surveys, and exclude individuals from active construction sites.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-12 (*Protections for Species and their Habitat*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) BIO-14 (*Maintenance, Staging, and Storage of Equipment*) BIO-15 (*Prevent Species Entrapment*) BIO-16 (*Wildlife Exclusion Fencing for Stationary Work Sites*) <u>Category 1</u> AMPH-1 (*Seasonal Amphibian Work Windows*) AMPH-2 (*Pre-Construction Amphibian Surveys*) AMPH-3 (*Biological Monitor and Daily Clearance Surveys*) AMPH-4 (*Amphibian Aquatic Habitat Avoidance and Minimization Buffer*) AMPH-5 (*Rain Limitations*)

Species	Effects of the Action	Conservation Measures
Amphibian CH Arroyo toad Kern Canyon slender salamander Relictual slender salamander Sierra Nevada yellow-legged frog	Project construction activities that result in ground disturbance or vegetation removal including conduit and vault installation could result in the physical loss of designated critical habitat or adverse effects on PBFs if those habitats or PBFs are present. Effects on these designated critical habitats and their PBFs would be avoided and minimized through the implementation of Category 1 measures. Caltrans will avoid installation of permanent infrastructure such as vaults and MVPs in areas with PBFs within designated critical habitat. Temporary disturbance in areas with PBFs within designated critical habitat will be restored. Any PBFs that cannot be restored will be avoided. Implementation of conservation measures will ensure that responses to stressors are insignificant to the conservation values of these critical habitats. Implementation of all General and Category 1 measures will ensure adverse effects will be insignificant or discountable.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) <u>Category 1</u> ARTO-1 (*Arroyo Toad Habitat Avoidance*)
Fishes Delta smelt Lahontan cutthroat trout Razorback sucker Santa Ana sucker Tidewater goby Unarmored threespine stickleback Longfin smelt	Construction activities that remove vegetation or disturb soil, could increase erosion and sedimentation, including turbidity, and may increase temperature. These stressors could degrade suitable aquatic habitat and or impair essential behaviors. Operation of heavy equipment could result in increased noise and vibration, changes in water quality, and could introduce potential hazardous materials, that could impair essential behavior or result in both acute and longer-term food-web based responses. Implementation of all General and Category 1 measures will ensure adverse effects are discountable.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) BIO-14 (*Maintenance, Staging, and Storage of Equipment*) <u>Category 1</u> FISH-1 (*Fish Aquatic Habitat Avoidance Buffer*) FISH-2 (*Rain Limitations*)

Species	Effects of the Action	Conservation Measures
Fish CH Delta smelt Santa Ana sucker	Construction activities that remove vegetation or disturb soil, could increase erosion and sedimentation, including turbidity, and may increase temperature. These stressors could degrade suitable aquatic habitat. Operation of heavy equipment could result in increased noise and vibration, changes in water quality, and could introduce potential hazardous materials, that could result in both acute and longer-term food-web changes. Implementation of all General and Category 1 measures will ensure adverse effects are discountable.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) BIO-14 (*Maintenance, Staging, and Storage of Equipment*) <u>Category 1</u> FISH-1 (*Fish Aquatic Habitat Avoidance Buffer*)
Morro shoulderband snail	Excavation could result in temporary changes in topography that could entrap and confine species and may expose them to increase predation, stress and impair essential behaviors. Ground disturbance activities, including vegetation removal and construction of permanent above ground facilities could alter predator or prey relationships, introduce invasive species or disease, disturb refugia and other suitable habitat, or result in direct contact or crushing. These stressors could degrade suitable habitat, impair significant behaviors, and may result in injury or mortality of individuals. Operation of heavy equipment could result in a vehicle strike that causes injury or mortality, exposure to hazardous materials that degrade habitat or harm individuals, changes to predator or prey distribution, or the introduction of invasive competitors or disease. Implementation of all General and Category 1 measures will ensure adverse effects are insignificant or discountable.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-12 (*Protections for Species and their Habitat*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) BIO-14 (*Maintenance, Staging, and Storage of Equipment*) BIO-15 (*Prevent Species Entrapment*) BIO-16 (*Wildlife Exclusion Fencing for Stationary Work Sites*) <u>Category 1</u> SNAIL-1 (*Pre-Construction Snail Surveys*) SNAIL-2 (*Biological Monitor and Daily Clearance Surveys*) SNAIL-3 (*Hand Removal of Vegetation*)

Species	Effects of the Action	Conservation Measures
Carson wandering skipper	Construction activity including conduit and vault installation could remove vegetation that degrades suitable habitat, increases temperature, as well as introduce invasive competitors or disease. Operation of heavy equipment could result in a vehicle strike that causes injury or mortality, and or could increased noise and vibration that and impairs essential behaviors including foraging and breeding or could introduce hazardous materials that degrade habitat or harm individuals or could change air quality which could harm individuals. Excavation, including conduit and vault installation, could change topography and introduce invasive competitors or disease that degrades suitable habitat, which may expose individuals to predation, increase stress, and impair essential behaviors. Exposure to these effects is discountable due to the implementation of General and Category 1 measures that will apply exclusion buffers and seasonal work windows to ensure that the species will not be impacted.	General BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-12 (*Protections for Species and their Habitat*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) Category 1 INSECT-1 (*Seasonal Insect Work Windows*)

Species	Effects of the Action	Conservation Measures
Butterflies El Segundo blue butterfly Hermes copper butterfly Kern primrose sphinx moth	Construction activity including conduit and vault installation could remove vegetation that degrades suitable habitat, increases temperature, as well as introduce invasive competitors or disease. Operation of heavy equipment could result in a vehicle strike that causes injury or mortality, and or could increase noise and vibration that impairs essential behaviors including foraging and breeding, or could introduce hazardous materials that degrade habitat or harm individuals, or could change air quality which could harm individuals or their host plants. Excavation, including conduit and vault installation, could change topography and introduce invasive competitors or disease that degrades suitable habitat, which may expose individuals to predation, increase stress, and impair essential behaviors. Exposure to these effects is discountable due to the implementation of General and Category 1 measures that will apply exclusion buffers and seasonal work windows to ensure that the species will not be impacted. Implementation of the work windows, surveys, and habitat exclusion buffers will ensure that responses to stressors from these species are insignificant. .	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-12 (*Protections for Species and their Habitat*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) <u>Category 1</u> INSECT-1 (*Seasonal Insect Work Windows*) HERMES-1 (*Hermes Copper Butterfly Habitat Avoidance on Interstate-8*)

Species	Effects of the Action	Conservation Measures
Insect CH Casey's June beetle Hermes copper butterfly Zayante band-winged grasshopper	Project construction activities that result in ground disturbance or vegetation removal including conduit and vault installation could result in the physical loss of designated critical habitat or adverse effects on PBFs if those habitats or PBFs are present. Effects on these designated critical habitats and their PBFs would be avoided and minimized through the implementation of General and Category 1 measures. Caltrans will avoid installation of permanent infrastructure such as vaults and MVPs in areas with PBFs within designated critical habitat. Temporary disturbance in areas with PBFs within designated critical habitat will be restored. Any PBFs that cannot be restored will be avoided. Implementation of conservation measures will ensure that responses to stressors are insignificant to the conservation values of these critical habitats.	General BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitats*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) Category 1 HERMES-1 (*Hermes Copper Butterfly Habitat Avoidance on Interstate-8*) ZAY-1 (*Avoid Critical Habitat Disturbance for Zayante Band-winged Grasshopper*)

Species	Effects of the Action	Conservation Measures
Crustacean CH San Diego fairy shrimp	Project construction activities that result in ground disturbance or vegetation removal including conduit and vault installation could result in the physical loss of designated critical habitat or adverse effects on PBFs if those habitats or PBFs are present. Effects on these designated critical habitats and their PBFs would be avoided and minimized through the implementation of Category 1 measures. Caltrans will avoid installation of permanent infrastructure such as vaults and MVPs in areas with PBFs within designated critical habitat. Temporary disturbance in areas with PBFs within designated critical habitat will be restored. Any PBFs that cannot be restored will be avoided. Implementation of conservation measures will ensure that responses to stressors are insignificant to the conservation values of these critical habitats.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporarily Disturbed Designated Critical Habitat*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) <u>Category 1</u> CRUS-2 (*Crustacean Aquatic Habitat Avoidance Buffer*) CRUS-3 (*Seasonal Crustacean Work Windows and Avoidance*) CRUS-4 (*Construction Methods to Limit Disturbance to Vernal Pool Habitats*)

Upland and Wetland Plants Ash-grey paintbrush Bakersfield cactus Bear Valley sandwort Ben Lomond spineflower Braunton's milk-vetch California jewelflower California taraxacum Chinese camp brodiaea Clara Hunt's milk-vetch Coastal dunes milk-vetch Cushenbury milk-vetch Cushenbury oxytheca Del Mar manzanita El Dorado bedstraw Encinitas baccharis Fish Slough milk-vetch Fountain thistle Hartweg's golden sunburst Hickman's potentilla Keck's checker-mallow La Graciosa thistle Laguna Beach liveforever Large-flowered fiddleneck Marin dwarf-flax Marsh sandwort Metcalf Canyon jewel-flower Monterey clover Monterey gilia Munz's onion Nevin's barberry Orcutt's spineflower Otay tarplant Peirson's milk-vetch Pine Hill flannelbush Red Hills vervain	Construction activity including conduit and vault installation could remove vegetation or disturb soil, resulting in direct harm to individuals and increased erosion and sedimentation, changes in temperature, or changes in hydrology that degrades suitable habitat and harms individuals, or results in adverse physiological changes. Operation of equipment could result in a vehicle strike that causes injury or mortality, and or the introduction of invasive species and disease and increase the potential for the introduction of hazardous materials. Excavation, including conduit and vault installation, could uproot individuals, or change hydrology that could result in species reduced health. Exposure to these effects is discountable due to the implementation of General and Category 1 measures that will apply surveys, exclusion buffers and BMPs to ensure that the species will not be impacted. Populations and suitable habitat will be avoided and temporarily disturbed areas will be restored. For populations along State Route (SR) 18, impacts will be avoided by constraining activities to the paved area of SR 18.	General BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitat*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-9 (*Pre-construction Surveys*) BIO-12 (*Protections for Species and their Habitat*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) BIO-14 (*Maintenance, Staging, and Storage of Equipment*) Category 1 PLANT-1 (*Pre-Construction Plant Surveys during Blooming Period*) PLANT-2 (*Avoidance Buffer of Covered Plants and their Habitats*) PLANT-3 (*Minimize Disturbance near Covered Plants and/or Suitable Habitat*) MARSH-1 (*Avoid Marsh Sandwort on SR 1*) PEBBLE-1 (*Avoid Impacts to Pebble Plain Species on SR 18*)

Species	Effects of the Action	Conservation Measures
Robust spineflower Salt marsh bird’s-beak San Diego thornmint San Francisco lessingia San Joaquin adobe sunburst Santa Ana River woollystar Santa Cruz cypress Santa Cruz tarplant Showy Indian clover Slender-horned spineflower Slender-petaled mustard Southern mountain wild-buckwheat Springville clarkia Tiburon paintbrush Triple-ribbed milk-vetch Ventura Marsh milk-vetch Verity’s dudleya Vine Hill clarkia Webber’s ivesia White sedge Willowy monardella Yadon’s piperia Yellow larkspur		

Species	Effects of the Action	Conservation Measures
Gambel's Watercress	Construction activity including conduit and vault installation could remove vegetation or disturb soil, resulting in direct harm to individuals and increased erosion and sedimentation, changes in temperature, or changes in hydrology that degrades suitable habitat and harms individuals or results in adverse physiological changes. Operation of equipment could result in a vehicle strike that causes injury or mortality, and or the introduction of invasive species and disease and increase the potential for the introduction of hazardous materials. Excavation, including conduit and vault installation, could uproot individuals, or change hydrology that could result in species reduced health. Exposure to these effects is discountable due to the implementation of General and Category 1 measures that will apply surveys, exclusion buffers and BMPs to ensure that the species will not be impacted. Populations and suitable habitat will be avoided and temporarily disturbed areas will be restored. For the Gambel's watercress population located near Bixby Slough area, impacts will be avoided by constraining project activities to the paved area of SR 1 or areas to the east.	General BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitat*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-9 (*Pre-construction Surveys*) BIO-12 (*Protections for Species and their Habitat*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) BIO-14 (*Maintenance, Staging, and Storage of Equipment*) Category 1 PLANT-1 (*Pre-Construction Plant Surveys during Blooming Period*) PLANT-2 (*Avoidance Buffer of Covered Plants and their Habitats*) PLANT-3 (*Minimize Disturbance near Covered Plants and/or Suitable Habitat*) GWC-1 (*Avoid Gambel's Watercress on SR 1 near Bixby Slough Area*)

Species	Effects of the Action	Conservation Measures
Vernal Pool Plants Lake County stonecrop	Construction activity including conduit and vault installation could remove vegetation or disturb soil, resulting in direct harm to individuals and increased erosion and sedimentation, changes in temperature, or changes in hydrology that degrades suitable habitat and harms individuals, or results in adverse physiological changes. Operation of equipment could result in the introduction of invasive species and disease and increase the potential for the introduction of hazardous materials. Exposure to these effects is discountable due to the implementation of General and Category 1 measures that will apply surveys, exclusion buffers, and BMPs to ensure that the species will not be impacted. Populations and suitable habitat will be avoided and temporarily disturbed areas will be restored. Implementation of the vernal pool conservation measures will ensure that project construction activities avoid pools and wetland by 250 feet or use a construction method that will not adversely affect pool hydrology.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitat*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-9 (*Pre-construction Surveys*) BIO-12 (*Protections for Species and their Habitat*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) BIO-14 (*Maintenance, Staging, and Storage of Equipment*) <u>Category 1</u> PLANT-1 *(Pre-Construction Plant Surveys during Blooming Period*) PLANT-2 (*Avoidance Buffer of Covered Plants and their Habitats*) PLANT-3 (*Minimize Disturbance near Covered Plants and/or Suitable Habitat*) VP-1 (*Pre-Construction Vernal Pool Plant Habitat Surveys*) VP-2 (*Vernal Pool Plant Aquatic Habitat Avoidance Buffer*) VP-3 (*Seasonal Vernal Pool Plant Species Work Windows*) VP-4 (*Construction Methods to Limit Disturbance to Vernal Pool Habitats*) VP-5 (*Rain Limitations*)

Species	Effects of the Action	Conservation Measures
Vandenberg monkeyflower	Construction activity including conduit and vault installation could remove vegetation or disturb soil, resulting in direct harm to individuals and increased erosion and sedimentation, changes in temperature, or changes in hydrology that degrades suitable habitat and harms individuals, or results in adverse physiological changes. Operation of equipment could result in a vehicle strike that causes injury or mortality, and or the introduction of invasive species and disease and increase the potential for the introduction of hazardous materials. Exposure to these effects is discountable due to the implementation of Category 1 measures that will apply surveys, exclusion buffers and BMPs to ensure that the species will not be impacted. Populations and suitable habitat will be avoided and temporarily disturbed areas will be restored. For the Vandenberg monkeyflower population located near Vandenberg Air Force Base area, impacts will be avoided by constraining project activities to the paved area of SR 1 or areas to the east.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitat*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-9 (*Pre-construction Surveys*) BIO-12 (*Protections for Species and their Habitat*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) BIO-14 (*Maintenance, Staging, and Storage of Equipment*) <u>Category 1</u> PLANT-1 (*Pre-Construction Plant Surveys during Blooming Period*) PLANT-2 (*Avoidance Buffer of Covered Plants and their Habitats*) PLANT-3 (*Minimize Disturbance near Covered Plants and/or Suitable Habitat*) VMF-1 (*Avoid Vandenberg Monkeyflower on SR 1 near Vandenberg Air Force Base*)

Species	Effects of the Action	Conservation Measures
Yreka phlox	Construction activity including conduit and vault installation could remove vegetation or disturb soil, resulting in direct harm to individuals and increased erosion and sedimentation, changes in temperature, or changes in hydrology that degrades suitable habitat and harms individuals, or results in adverse physiological changes. Operation of equipment could result in a vehicle strike that causes injury or mortality, and or the introduction of invasive species and disease and increase the potential for the introduction of hazardous materials. Exposure to these effects is discountable due to the implementation of Category 1 measures that will apply surveys, exclusion buffers and BMPs to ensure that the species will not be impacted. Populations and suitable habitat will be avoided and temporarily disturbed areas will be restored. For the Yreka phlox population located near SR 3 in Siskiyou County area, impacts will be avoided by constraining project activities to the paved area and implementation of a dust abatement plan.	<u>General</u> BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporary Impacts to Occupied Habitat and Designated Critical Habitat*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) BIO-9 (*Pre-construction Surveys*) BIO-12 (*Protections for Species and their Habitat*) BIO-13 (*Water Quality, Aquatic Features, and Vegetation Protection Measures*) BIO-14 (*Maintenance, Staging, and Storage of Equipment*) <u>Category 1</u> PLANT-1 (*Pre-Construction Plant Surveys during Blooming Period*) PLANT-2 (*Avoidance Buffer of Covered Plants and their Habitats*) PLANT-3 (*Minimize Disturbance near Covered Plants and/or Suitable Habitat*) PHLOX-1 (*Avoid Yreka Phlox on SR 3 in Siskiyou County*)

Species	Effects of the Action	Conservation Measures
Upland & Wetland Plant CH California taraxacum Coachella Valley milk-vetch Franciscan manzanita Peirson's milk-vetch Robust spineflower San Bernardino bluegrass Santa Cruz tarplant Webber's ivesia	Project construction activities that result in ground disturbance or vegetation removal including conduit and vault installation could result in the physical loss of designated critical habitat or adverse effects on PBFs if those habitats or PBFs are present. Effects on these designated critical habitats and their PBFs would be avoided and minimized through the implementation of Category 1 measures. Caltrans will avoid installation of permanent infrastructure such as vaults and MVPs in areas with PBFs within designated critical habitat. Temporary disturbance in areas with PBFs within designated critical habitat will be restored. Any PBFs that cannot be restored will be avoided. Implementation of conservation measures will ensure that responses to stressors are insignificant to the conservation values of these critical habitats. Implementation of all Category 1 measures will ensure adverse effects will be insignificant or discountable.	General BIO-3 (*Design Impact Avoidance and Minimization*) BIO-4 (*Restore Temporarily Disturbed Designated Critical Habitat*) BIO-5 (*Site Restoration*) BIO-6 (*Invasive Plants*) Category 1 PLANT-2 (*Avoidance Buffer of Covered Plants and their Habitats*) PLANT-3 (*Minimize Disturbance near Covered Plants and/or Suitable Habitat*)

NOTES:
DPS = Distinct Population Segment
CH = critical habitat
PBF = physical and biological feature

PROGRAMMATIC BIOLOGICAL AND CONFERENCE OPINION

DESCRIPTION OF THE PROPOSED ACTION

We summarized the following information from Chapter 2 of the PBA (Caltrans 2023). Refer to the PBA for additional details regarding the description of the proposed action.

Overview

Caltrans proposes to carry out or authorize the construction of a statewide, middle-mile fiber optic broadband internet network within or adjacent to rights-of-way along approximately 10,000 miles of the SHS. The MMBN would expand California's broadband fiber infrastructure and increase internet connectivity for families and businesses, with a particular emphasis on currently underserved communities. The network would consist of open access, high-capacity fiber lines that carry large amounts of data at high speeds over long distances between local networks.

SB 156 designated CDT as the state entity responsible for the Middle-Mile Broadband Initiative, and tasked CDT with oversight and management of the MMBN, including planning, design, construction, maintenance, and operation. To support CDT's delivery of the network and given Caltrans' ownership of the SHS and expertise in delivering essential infrastructure projects, SB 156 assigned Caltrans the responsibility to construct the MMBN.

The MMBN would be constructed through the installation of fiber optic conduits, vaults to pull and splice fiber optic cable, and network hubs to amplify communication signals through the fiber optic cable. The conduit would be installed primarily underground, using trenching and trenchless methods, parallel to and primarily within the Caltrans rights-of-way. The Covered Activities section below describes the methods that Caltrans would use to implement the MMBN project. The terms "covered activities" and "project activities" will be used interchangeably throughout the PBO.

CDT will rely on several diverse contracting and build methods to construct the MMBN, including Caltrans builds, joint builds, leases, and purchases. For Caltrans builds, Caltrans oversees the construction of the physical infrastructure located within the Caltrans rights-of-way. For joint builds, a private sector contractor constructs the physical infrastructure, with ownership being a joint venture between CDT and the private contractor. For leasable miles, CDT executes long-term leases for a specified number of fibers on existing infrastructure. For purchases, CDT procures existing infrastructure and becomes the outright owner. For joint build, lease, or purchase methods, Caltrans would be involved in project development or permitting when projects were located within or adjacent to Caltrans rights-of-way.

The MMBN would conform to the following design requirements:

- Install three to four 2-inch high-density polyethylene (HDPE) conduits.
- Place pull vaults every 2,400 feet along the fiber optic conduit path.

- Place splice vaults every 12,000 feet along the fiber optic conduit path.
- Place network hub shelters approximately every 50 miles along the fiber optic cable path.

A summary of conduit installation methods and project features is detailed in Table 4, below.

Table 4. Summary of MMBN features and installation methods, including dimensions and anticipated project footprints.

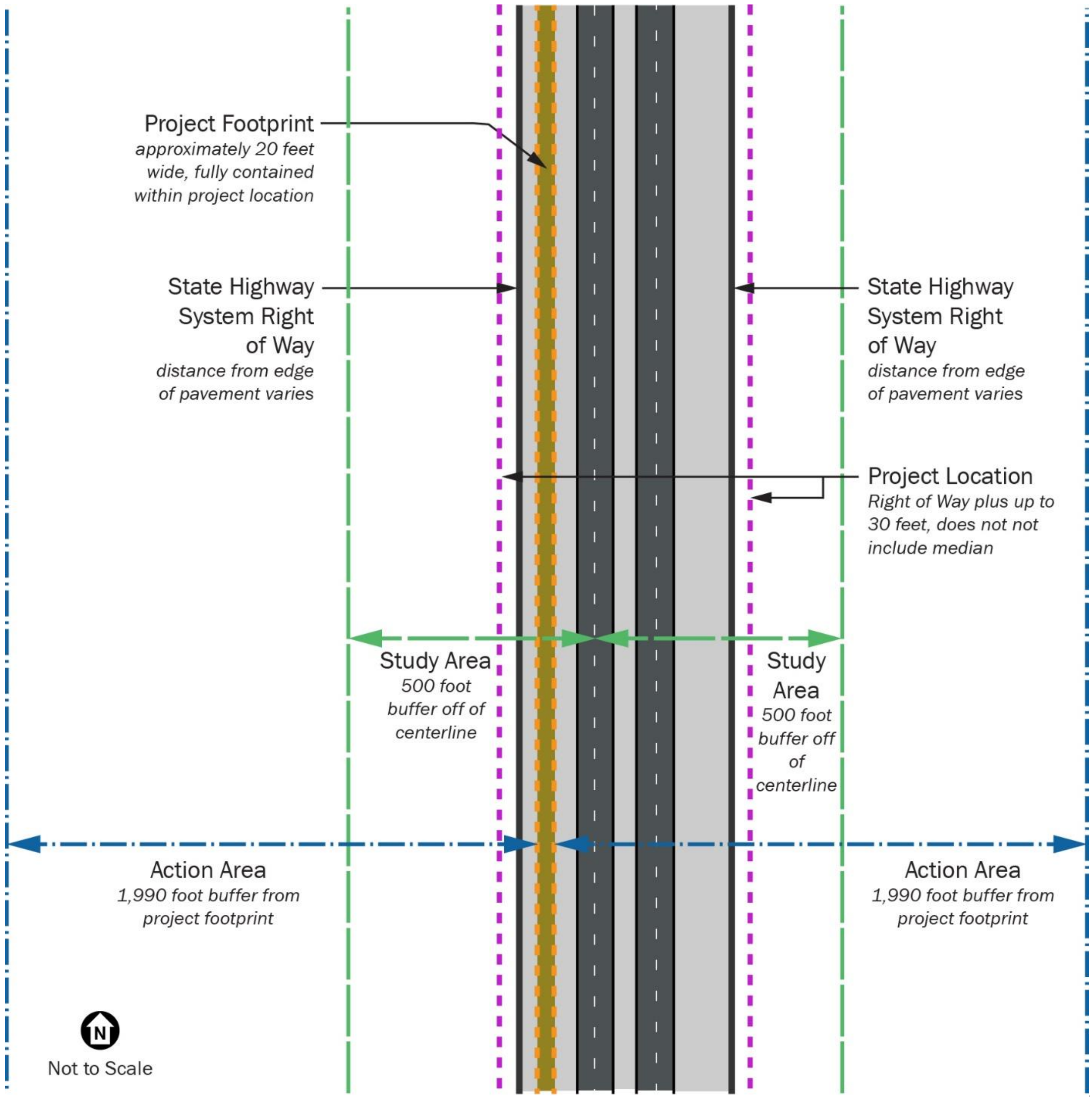
Conduit Installation Method/Project Feature	Dimensions	Interval	Anticipated Project Footprint Area Dimensions
Plowing	4-inch-wide trench, 48 inches in depth	Continuous installation	Temporary construction footprint up to 20 feet wide
Trench	6 to 12 inches wide, 46 to 50 inches in depth	Continuous installation	Temporary construction footprint up to 20 feet wide
Trench in pavement – asphalt paved surfaces	3 to 6 inches wide, minimum of 24 inches in depth	Continuous installation	Temporary construction footprint up to 20 feet wide
Horizontal directional drilling	8 inches in diameter, minimum of 42 inches and maximum of 20 feet in depth.	Continuous installation	Temporary construction footprint up to approximately 50 feet wide by 100 feet long for shorter drilling bore lengths and up to approximately 100 feet by 150 feet for longer drilling bore lengths; a 7-foot-wide by 7-foot-long by 5-foot-deep drilling pit would be excavated within the temporary construction footprint area on each side of the drilling bore length
Jack and drill	Casing—6 inches in diameter for 3 conduit installation, 8 inches in diameter for 4 conduit installation	Continuous installation	Temporary construction footprint up to 20 feet wide
Installation of fiber on existing or new utility poles	Variable dimensions	Continuous installation	Temporary construction footprint up to 20 feet wide
Attachment on structures: bridges, culverts, concrete barriers, and soundwalls	Variable dimensions	Continuous installation	Temporary construction footprint up to 20 feet wide
Vault, Type 1 (pull vault)	30 inches wide by 48 inches long by 36 inches deep	Every 2,400 feet; estimated total of 17,000 Type 1 and Type 3 vaults (pull vaults)	Temporary construction footprint up to 20 feet wide; permanent construction footprint up to 20 square feet

Conduit Installation Method/Project Feature	**Dimensions**	**Interval**	**Anticipated Project Footprint Area Dimensions**
Vault, Type 3 (pull vault)	Total of 42 inches wide by 60 inches long by 36 inches deep, with 6-inch layer of Portland cement concrete on all sides	Every 2,400 feet; estimated total of 17,000 Type 1 and Type 3 vaults (pull vaults)	Temporary construction footprint up to 20 feet wide; permanent construction footprint up to 20-square feet
Vault, Type 2 (splice vault)	48 inches wide by 48 inches long by 48 inches deep	Every 12,000 feet; estimated total of 4,000 Type 2 (splice vaults)	Temporary construction footprint up to 20 feet wide; permanent construction footprint up to 20 square feet
Maintenance vehicle pullouts	85 feet long by up to 10 to 12 feet wide trapezoid	At Type 2 splice vaults that can only be accessed from the mainline or ramps on non-Interstate routes where 8-foot width shoulder or existing area with safe parking are not available; estimated interval of every 12,250 feet	Temporary construction footprint up to 20 feet wide; permanent construction footprint up to 780 square feet
Fiber optic markers	Metallic disk markers: 4 inches in diameter; fiber optic markers for unpaved areas and vaults: 3-inch diameter round posts	Every 500 feet	Temporary construction footprint up to 20 feet wide
Network hub shelters	Variable dimensions	Approximately every 50 miles; approximate total of 200 hubs for the entire network	Temporary construction footprint variable; permanent construction footprint up to 2,500 square feet
Temporary and permanent access roads	Network hub shelter access roads: 20 feet wide; all other access roads: variable dimensions	Network hub shelter access roads: at certain locations where needed; all other access roads: at various non-specific intervals	Temporary and permanent construction footprint width variable
Staging areas	Variable dimensions	At various non-specific intervals	Temporary construction footprint width variable

Location

The PBA and this PBO refer to several different types of locations, defined below:

- *Action Area* includes all areas (e.g., land, air, or water) that would be affected directly or indirectly by the proposed action including the *project footprint* and the limits of direct (e.g., ground disturbance) and indirect (e.g., noise) effects of the proposed action. The action area is larger than the *project footprint*, allowing for consideration of the effects of all project activities (such as noise, lighting, and downstream water quality). The action area includes the rights-of-way of the SHS and up to 30 feet outside of the existing rights-of-way, and may extend outside the rights-of-way to account for indirect effects (see Figure 1).
- *Project Location* is the boundary within which construction activities for the project would occur. The *project footprint* would be wholly contained within the project location. The project location would occur in the SHS and within or up to 30 feet outside the existing SHS rights-of-way (see Figure 1).
- *Project Footprint* is the area within the *project location* where construction activities would occur and include the temporary construction footprint and the permanent construction footprint. The temporary construction footprint would be 20 feet wide for most conduit installation methods and may require temporary work areas up to 15,000 square feet for select installation methods (e.g., HDD, jack and drill). Permanent construction footprints would occur at proposed vaults, maintenance vehicle pullouts, and network hubs. Caltrans anticipates that those footprints would be approximately 20 square feet, 780 square feet, and 2,500 square feet, respectively.
- *Study Area* is the 500-foot buffer around the left alignment centerline of all SHS segments included in the MMBN. Because the exact location of conduit alignment and other MMBN features are not yet known, the study area was applied to capture potential habitat types reasonably expected to occur in or immediately adjacent to the *project footprint* (see Figure 1). Caltrans uses the study area to model: 1) potential maximum permanent and temporary impacts to covered species habitats, and covered critical habitats; and 2) the amount of suitable habitat for covered species in the vicinity of potential *project locations*.



SOURCE: Caltrans 2023

Caltrans Middle-Mile Broadband Network

Figure 1. A schematic representation of the relationship between the action area, study area, project location, and project footprint.

Covered Activities

Construction

Conduit Installation: Caltrans would install three to four 2-inch HDPE conduits, either in a bundle or within a larger 6- or 8-inch casing. The precise location of conduits would depend upon the logistics of each site, including but not limited to the presence of – and Caltrans' ability to avoid – sensitive environmental resources and existing utilities, but Caltrans would generally site conduit within the right-of-way (e.g., along fences, adjacent to the roadway prism, in pavement, etc.) or up to 30 feet beyond the right-of-way limits. Caltrans would not install conduit in highway medians. Caltrans would use several methods to install conduit at various locations to accommodate constraints, including considerations for sensitive resources, discussed below:

1. **Plowing** a 4-inch-wide trench with a tracked vehicle with a cable reel in front and a plow blade in back. As the vehicle moves, it simultaneously furrows the soil and installs the conduit or cable. In some instances, a tractor in front of the plow may rip the soil to loosen it by inserting a slit that is 8 inches deeper than the depth of the conduit (i.e., minimum of 50 inches). The construction corridor is usually 20 feet wide, but Caltrans can restrict it to some degree in sensitive areas. Caltrans would clear and grub all woody vegetation, and sometimes grade the terrain, before plowing. Plowed installation does not produce trenches that require filling at the end of each day.

2. **Open trenching** a 6- to 12-inch-wide trench with a rubber-tired backhoe or an excavator. With this method, Caltrans would dig a trench 6 to 12 inches wide and 46 to 50 inches deep. A crew would typically expose no more than 1,000 feet of trench at any time during construction and would fill it at the end of each day with at least 10 inches of sand backfill, then native soils. If the crew cannot backfill isolated areas, such as vaults or assist points at the end of each day, it would install appropriate safety, erosion, and wildlife control features. Caltrans would clear and grub all woody vegetation, and sometimes grade the terrain, before trenching.

3. **In-pavement trenching** a 3- to 6-inch-wide trench 24 to 26 inches deep and backfilling it with slurry. This method uses a saw blade to cut into asphalt and a vacuum truck/trailer to remove debris. The construction corridor width for this method is up to 20 feet. Caltrans would use in-pavement trenching in urban areas, where extensive environmental review is not typically required. Caltrans would be restricted to using this method only in asphalt pavement shoulders where off-pavement methods are not feasible, shoulder/lane widening is not anticipated, and no high-risk utility lines are present.

4. **Horizontal directional drilling (HDD)** or **jacking and boring** an 8- to 14-inch-diameter bore hole between 3.5 and 20 feet deep. Caltrans would use this method where open-cut trenching is not feasible or desirable, including at stream crossings and drainage culverts (and where conduit cannot be attached to a structure), or to avoid sensitive resources. For

river, stream, and wetland crossings, Caltrans would locate work areas away from the bank or edge of the wetland resource. For both methods, Caltrans would excavate a pit at either end of the pipe segment.

a. HDD uses a surface-launched drilling rig to drill small horizontal borings between two pits. The boring is filled with drilling fluid and enlarged to approximately 12-inches in diameter using a back reamer or hole opener, and the conduit pulled into position. Once placement is complete the entry and exit pits are backfilled and compacted. Segment lengths using this method can range from less than 100 feet to more than 1,000 feet, averaging approximately 500 feet depending on the equipment used. Caltrans would require a work area of up to approximately 50 by 100 feet for shorter drilling bore lengths and up to approximately 100 by 150 feet work area for longer drilling bore length. In sensitive areas, Caltrans can reduce the size of this area. Within this area, Caltrans would excavate a drilling pit approximately 7 by 7 by 5 feet on each side of the drilling bore length. Caltrans can also reduce the size of drilling pits in sensitive areas. Caltrans would develop a "Frac-Out Plan" prior to starting HDD activities.

b. Jacking and boring uses a horizontal auger to drill a hole, and a hydraulic jack to push steel casing through the hole to the egress pit. Caltrans would then install piping once casing is in place. Caltrans would typically use jacking and boring at railroad and roadway crossings to prevent soil subsidence.

5. **Installation on existing or new utility poles** in certain limited circumstances, where underground installation is not possible, within a temporary construction footprint 20 feet wide. Caltrans would only use this method where other methods are not available. Installation of new utility poles may require foundations. New utility poles and any required foundations would have a footprint of approximately 1 square foot.

6. **Attachment to structures**, including bridge- or culvert-mounted conduits utilizing existing utility openings inside box girder bridges (between girders) or existing utility openings in sidewalks or in bridge rails, concrete barriers, or soundwalls. Occasionally, Caltrans may attach conduit to the exterior surface of concrete bridge rails or the soffit of deck overhangs.

Vaults: Caltrans would install vaults approximately 2,500 feet apart – or more frequently in locations with sharp turns, bends, or branches in the alignment – and at bridge crossings. Vaults would be built with the top flush with the surrounding grade in paved areas, or 2 inches above the ground in unpaved areas. Caltrans may also bury vaults a minimum of 6 to 8 inches below the surface. Most vaults would be 30 by 48 by 36 inches; every fifth vault would be 48 by 48 by 48 inches to allow for splicing. The excavations for vaults would be 12 inches larger by width and length than the vault. Caltrans would construct maintenance access infrastructure (i.e., maintenance vehicle pullouts) for unburied vaults on non-interstate routes where there is not existing access. Each pullout would be a trapezoid of asphalt a maximum of 85 feet in length by 10 to 12 feet in width. Buried vaults would not require maintenance access.

Fiber optic cable installation in conduit: A fiber pulling work crew would install fiber optic cable in newly installed or existing conduit. Before pulling fiber optic cable through the conduit, this crew would check or proof the conduit to ensure that it is clear and did not collapse or deform during installation, typically by blowing a small object, such as a mandrel, through the conduit using highly pressurized air. Once the conduit has been proofed, the crew would pull or blow fiber optic cable through the conduit. The pull method uses pre-installed pull tape; the blow method uses highly pressurized air. This activity would occur only at vault locations.

Fiber optic marker posts: Caltrans would locate posts at approximately 500-foot intervals to signal the presence of below-ground cable. The posts would typically be 3 inches in diameter and made of PVC. Caltrans would place additional marker posts at any buried vault structures. Smaller, metallic marker discs 4 inches in diameter would mark the alignment in paved areas. Caltrans would, concurrent with conduit installation, bury an underground polymer marker tape approximately 2 feet under the surface along the entire length of the conduit. Fiber optic marker posts would be installed after the cable is installed in conduits.

Network hubs: Caltrans would construct approximately 200 network hubs statewide to amplify and retransmit signals. Network hubs would be placed on a concrete pad with a fenced area of approximately 50 by 50 feet. The structure itself would be 12 by 20 by 10 feet or, in some locations 12 by 16 by 10 feet. Caltrans would place hubs on a concrete pad with a 5-foot concrete sidewalk surrounding the structure, resulting in a concrete foundation of 22 by 30 feet for the larger hub, or 22 by 26 feet wide for the smaller hub. Caltrans would not place hubs in waters of the U.S. or state. Additionally, Caltrans would place network hubs a maximum of 50 miles apart and in proximity to power hook-up. Some hubs would need temporary or permanent access roads. Caltrans would use geotechnical boring to determine the suitability of soils before placing foundations.

Temporary and permanent access roads: Access to most project locations would be provided by existing developed roads; however, temporary and permanent access roads would be needed for construction and installation of network hubs and vaults. Caltrans would use existing roads to access projects where possible; however, network hubs not located within existing paved areas, such as a Caltrans maintenance facility, would require construction of a 20-foot-wide access road paved with asphalt over 6 inches of aggregate base. New access roads may be necessary to access vaults, but Caltrans would avoid creating new roads if possible.

Dewatering: Dewatering may be necessary to perform work at some project locations with groundwater flows, such as vault pits or jack and drill pits. Caltrans would not dewater natural water bodies for construction activities. Caltrans would conduct dewatering in accordance with the Caltrans Field Guide to Construction Site Dewatering. A dewatering and discharge work plan would be developed before the start of any dewatering activities, detailing the locations of dewatering and discharge activities, the quantity of water, equipment, and the discharge point.

The dewatering and discharge work plan would conform to Standard Specification Section 13-4.01C. Dewatering discharges would not cause erosion, scour, or sedimentation that could affect natural bedding materials.

Staging

Caltrans would establish staging areas for construction equipment, materials, fuels, lubricants, and solvents along project routes during construction. Staging areas are typically locations where materials or equipment are stored for more than 2 days. Caltrans may also establish temporary parking areas to park vehicles and equipment during the day or overnight.

Caltrans would deliver conduits, vaults, and fiber to construction sites, where they would be stored and staged. Caltrans would store most other materials in warehouses throughout the state and deliver these materials to contractors.

Site Preparation

Where needed, Caltrans would clear vegetation to accommodate construction. For some conduit installation methods, such as plowing, Caltrans would remove or trim woody or densely vegetated areas. Caltrans could clear and grub uneven ground surfaces for activities such as HDD or jacking and boring.

Site Restoration

In areas where ground disturbance occurs, Caltrans would recontour the work area to its original grade and soil structure and would revegetate the work area to the greatest extent practicable (see BIO-5: Site Restoration).

Equipment

Caltrans would use a variety of equipment to implement the proposed project (see Table 5).

Table 5. Proposed construction equipment.

Pickup trucks	Vibratory plow
Mower	Cable plow
Chipper	Mud motor with rotary steerable system
Dozer	Auger boring machine
Grader	Bulldozer with plow blade
Scraper	Tractor with reel carrier
Backhoe	Bulldozer with ripper blade
Generator	Tracked trenching machine
Dump truck	Rockwheel trencher
Jackhammer	Crane
Excavator	Horizontal boring auger
Trencher with rock-wheel blade	Snooper truck
Concrete/asphalt cutting saw	Truck vacuum excavator with hydraulic boom
Vacuum truck or trailer	Air compressor
Road roller compactor	Cable blowing machine
Cold plane machine	Pickup trucks Horizontal directional drill machine

<u>Project Timing and Duration of Work</u>

Caltrans would schedule project activities to accommodate construction and covered species' needs to the extent feasible. Project activities would occur year-round, during the day or night; however, they would be scheduled to avoid sensitive seasons and life-history periods of covered species to the extent feasible, and preconstruction surveys would be conducted before the initiation of covered activities, as described in the Conservation Measures section of this PBO.

We anticipate that project activities covered by this PBO would commence in the fall of 2023, with work estimated to be completed in 5 years. Typically, installation work at any given location would take 5 to 15 days to complete. At complex locations, such as jack and drill locations where a solid casing would be installed under a roadway or railroad tracks or where network hub shelters would be constructed, work may extend to 30 or more days.

<u>Maintenance and Future Operations</u>

As the owner/operator of the MMBN, CDT is responsible for operations and maintenance activities. Future activities to operate and maintain the MMBN within Caltrans' rights-of way would be permitted through an encroachment permit or right-of-way use agreement with Caltrans. The encroachment permit or right-of-way use agreement issued by Caltrans would include the requirements for future permits and approvals. CDT, or their designated responsible party, would be responsible for fulfilling these requirements before initiating operation and maintenance activities. Future operations and maintenances activities that occur on lands under the jurisdiction of federal land management agencies would require authorization from the respective land agency. If operations and maintenance activities may affect listed species or designated critical habitats, rising above the baseline level of existing disturbance, a separate consultation with the Service would be conducted with the appropriate federal action agency (e.g., Caltrans, FHWA, a federal land management agency, or the Army Corps of Engineers).

If operations and maintenance activities may affect listed species or designated critical habitats and there is no federal nexus for consultation, then CDT, their third-party administrator, or another project proponent will coordinate with the Service.

Cable or conduit access or repair would be done through the vaults installed as part of the MMBN project. Vault access would be on as as-needed basis, 1 day or less in duration. Because splice vaults would be installed either adjacent to a shoulder or a maintenance vehicle pullout, or within the pavement of a maintenance vehicle pullout, accessing vaults would likely result in minimal foot and vehicle traffic, primarily limited to existing paved surfaces. Auditory, vibratory, and visual disturbance may occur during vault access, but Caltrans does not anticipate that effects from these activities would be above baseline levels of disturbance from standard traffic and operations.

Future Maintenance Needs

Vaults: Inspections of both pull and splice vaults would consist primarily of visual inspections performed on an as-needed basis. Caltrans anticipates that post-construction inspections would last 1 day or less. Limited access to pull vaults would be necessary after installation to either pull, splice, or repair fiber optic cable or install an additional fiber optic cable in the network. Scheduled inspections for splice vaults would be required in conjunction with a request made by a third party (e.g., regional internet service provider, telecommunications carrier, enterprise) for access to the MMBN at the installed splice vaults. Splice vaults would be installed either adjacent to a shoulder or a maintenance vehicle pull out, or within the pavement of a maintenance vehicle pullout. Caltrans expects that vault inspections would result in minimal foot and vehicle traffic, primarily limited to existing paved surfaces. Auditory, vibratory, and visual disturbance may occur during vault access but effects from these operations are not expected to be above baseline levels of disturbance from standard traffic and operations.

Hubs: Inspections of network hubs would address generators and HVAC operations. Caltrans anticipates that inspections of network hubs would occur monthly, and last 1 day or less at any location. The area within the fenced hub yard would be treated with herbicides as part of fire protection requirements. Unpaved areas within the fenced hub yard would be covered with gravel to prevent erosion and allow for maintenance vehicle parking. A 20-foot or wider paved access road leading to network hub shelters not located within existing facilities, such as a Caltrans maintenance station, would be constructed. Caltrans expects that hub inspections would result in minimal foot and vehicle traffic, primarily limited to existing paved surfaces. Auditory, vibratory, and visual disturbance may occur during vault access but effects from these operations are not expected to be above baseline levels of disturbance from standard traffic and operations.

Conduit: The conduit placed underground would not require scheduled inspections, except in rare cases of emergency repairs of a cut cable or a technical problem.

Anticipated Maximum Permanent and Temporary Impacts, and Self-Imposed Limits

Caltrans used a habitat association model to estimate maximum impacts to both covered species' habitats and covered critical habitats. Chapter 1 of the PBA describes model parameters, limitations, and assumptions; Chapter 4 describes the amount and extent of modeled impacts (Caltrans 2023, 2024).

Caltrans committed to self-imposed limits for take of covered animals, and limits to impacts to both covered plant and animal habitats. Definitions of permanent and temporary impacts are described in the Compensatory Mitigation Framework section below. Caltrans will not exceed the lesser of either the modeled or the self-imposed impacts to covered species' habitats. The tables below show Caltrans' estimated impacts to covered animal species' habitat and self-imposed take limits (Table 6), estimated impacts and self-imposed maximum disturbance to covered plant habitat (Table 7), and estimated impacts to covered critical habitats (Table 8). Maximum allowable habitat impacts are additionally specified for certain species habitats (e.g., crustaceans, vernal pool plants) that could be permanently impacted by conduit installation or ground disturbance within 250 feet of the covered species habitat.

Temporary impact estimates are based on conduit installation; however, conduit installation could cause permanent impacts in certain situations. Specifically, we expect that ground disturbance or disruption of the duripan that occurs within 250 feet of a vernal pool or swale will result in permanent impacts, even though conduit installation is considered a temporary impact in other habitats. As described in the Compensatory Mitigation Framework section below, we consider the extent of permanent impacts to vernal pools to include the entirety of the wetted acres of aquatic features that occur, wholly or partially, within 250 feet of the ground-disturbing project activities (i.e., above- or below-ground soil disturbance). If soil-disturbing activities occur within 250 feet of a vernal pool which is not contiguous with those activity areas (i.e., separated by a compacted roadway or other complete barrier to the hydrology that supports the vernal pool), then the feature is unlikely to be permanently affected by the activities.

Table 6. Estimated maximum impacts on covered animal species' habitats and Caltrans' self-imposed take limits.

Covered Species	Habitat	Modeled Temporary Impacts (acres)	Modeled Permanent Impacts (acres)	Self-Imposed Take Limits: Injury, Mortality, Harm	Self-Imposed Take Limits: Capture and Relocation
Mammals					
Buena Vista Lake ornate shrew	All	32.28	0.13	Injury or mortality of no more than 5 individuals.	5 Individuals
Giant kangaroo rat	All	462.58	1.92	Injury or mortality of no more than 5 individuals.	40 Individuals
Peninsular bighorn sheep	All	40.12	0.17	None	None
Point Arena mountain beaver	All	4.42	0.02	None	None
Salt marsh harvest mouse	All	110.78	0.46	None	None
San Bernardino Merriam's kangaroo rat	All	335.79	1.39	Injury or mortality of no more than 5 individuals.	40 Individuals
Stephen's kangaroo rat	All	107.59	0.45	Injury or mortality of no more than 5 individuals.	20 Individuals
Tipton kangaroo rat	All	208.07	0.86	Injury or mortality of no more than 5 individuals.	20 Individuals
Birds					
California Ridgway's rail	All	43.64	0.18	None	None
California spotted owl – Coastal-Southern California DPS	All	174.79	0.72	Reduced productivity for up to 4 nesting pairs due to increased noise, lighting, and construction disturbance for one breeding season.	None
California spotted owl – Sierra Nevada DPS	All	1,148.09	4.75	Reduced productivity for up to 4 nesting pairs due to increased noise, lighting, and construction disturbance for one breeding season.	None
Coastal California gnatcatcher	All	669.28	2.77	Reduced productivity for up to 5 nesting pairs due to increased noise, lighting, and construction disturbance for one breeding season.	None

Covered Species	Habitat	Modeled Temporary Impacts (acres)	Modeled Permanent Impacts (acres)	Self-Imposed Take Limits: Injury, Mortality, Harm	Self-Imposed Take Limits: Capture and Relocation
Least Bell’s vireo	All	78.97	0.33	Reduced productivity for up to 5 nesting pairs due to increased noise, lighting, and construction disturbance for one breeding season.	None
Northern spotted owl	All	1,259.96	2.19	Reduced productivity for up to 4 nesting pairs due to increased noise, lighting, and construction disturbance for one breeding season.	None
Southwestern willow flycatcher	All	132.85	0.55	Reduced productivity for up to 5 nesting pairs due to increased noise, lighting, and construction disturbance for one breeding season.	None
Yuma Ridgway’s rail	All	22.60	0.09	None	None
Reptiles					
Alameda whipsnake	All	84.08	0.35	Injury or mortality of no more than 5 individuals.	5 Individuals
Blunt-nosed leopard lizard	All	99.78	0.41	None	None
Coachella Valley fringe-toed lizard	All	55.53	0.23	Injury or mortality of no more than 5 individuals.	5 Individuals
Giant garter snake	Aquatic	54.94	0.23	Injury or mortality of no more than 5 individuals.	5 individuals
	Terrestrial	224.69	0.93		
Northwestern pond turtle	Aquatic	240.79	1.00	Injury or mortality of no more than 30 individuals and 3 disturbed nests.	100 Individuals
	Terrestrial	5,838.33	24.17		
San Francisco garter snake	Aquatic	0.02	0.00	None	None
	Terrestrial	3.23	0.01		

Covered Species	Habitat	Modeled Temporary Impacts (acres)	Modeled Permanent Impacts (acres)	Self-Imposed Take Limits: Injury, Mortality, Harm	Self-Imposed Take Limits: Capture and Relocation
Southwestern pond turtle	Aquatic	27.84	0.12	Injury or mortality of no more than 10 individuals and 2 disturbed nests.	50 Individuals
	Terrestrial	1,646.22	6.82		
Amphibians					
Arroyo toad	All	219.60	0.91	Injury or mortality of no more than 10 individuals.	50 Individuals
California red-legged frog	Aquatic	45.46	0.19	Injury or mortality of no more than 15 individuals.	75 Individuals
	Terrestrial	2,858.18	11.83		
California tiger salamander–Central Valley DPS	Aquatic	23.52	0.10	Injury or mortality of no more than 15 individuals. Not to exceed 25 acres of suitable aquatic habitat impacted directly or indirectly by adverse effects within 250 feet of the feature.	75 Individuals
	Terrestrial	1,137.49	4.71		
California tiger salamander–Santa Barbara DPS	Aquatic	1.00	0.00	Injury or mortality of no more than 5 individuals. Not to exceed 1 acre of suitable aquatic habitat impacted directly or indirectly by adverse effects within 250 feet of the feature.	25 Individuals
	Terrestrial	41.51	0.17		
California tiger salamander–Sonoma DPS	Aquatic	1.00	0.00	Injury or mortality of no more than 5 individuals. Not to exceed 1 acre of suitable aquatic habitat impacted directly or indirectly by adverse effects within 250 feet of the feature.	25 Individuals
	Terrestrial	24.97	0.10		
Kern Canyon slender salamander	All	15.34	0.06	Injury or mortality of no more than 5 individuals.	10 Individuals
Relictual slender salamander	All	23.25	0.10	Injury or mortality of no more than 5 individuals.	10 Individuals

Covered Species	Habitat	Modeled Temporary Impacts (acres)	Modeled Permanent Impacts (acres)	Self-Imposed Take Limits: Injury, Mortality, Harm	Self-Imposed Take Limits: Capture and Relocation
Western spadefoot–northern DPS	Aquatic	110.95	0.46	Injury or mortality of no more than 30 individuals.	100 Individuals
	Terrestrial	4,209.67	17.43		
Western spadefoot–southern DPS	Aquatic	18.74	0.08	Injury or mortality of no more than 15 individuals.	75 Individuals
	Terrestrial	934.09	3.87		
Insects					
Bay checkerspot butterfly	All	16.23	0.07	Removal of 50 host plants.	None
Behren's silverspot butterfly	All	119.36	0.49	Removal of 75 host plants.	None
Callippe silverspot butterfly	All	15.90	0.07	Removal of 50 host plants.	None
Casey's June beetle	All	0.67	0.00	Injury or mortality of no more than 5 individuals	5 Individuals
Delhi sands flower-loving fly	All	0.62	0.00	Not to exceed 0.62 acre of impact on suitable habitat.	None
Mission blue butterfly	All	13.14	0.05	Removal of 50 host plants.	None
Monarch butterfly	All	4,512.83	18.68	Removal of 100 breeding host plants.	None
Mount Herman June beetle	All	0.17	0.00	Injury or mortality of no more than 5 individuals.	5 Individuals
Myrtle's silverspot butterfly	All	75.36	0.00	Removal of 75 host plants.	None
Oregon silverspot butterfly	All	5.77	0.31	Removal of 50 host plants.	None
Quino checkerspot butterfly	All	156.31	0.02	Not to exceed 10.00 acres of temporary impact and 0.02 acre of permanent impact on host plants.	None
San Bruno elfin butterfly	All	1.16	0.65	Removal of 20 host plants.	None
Smith's blue butterfly	All	16.36	0.00	Removal of 50 host plants.	None
Valley elderberry longhorn beetle	All	22.72	0.07	Removal of 100 host plants.	Transplant of 100 host plants

Covered Species	Habitat	Modeled Temporary Impacts (acres)	Modeled Permanent Impacts (acres)	Self-Imposed Take Limits: Injury, Mortality, Harm	Self-Imposed Take Limits: Capture and Relocation
Crustaceans					
Conservancy fairy shrimp	All	1,369.91	5.47	Not to exceed 25 acres of suitable aquatic habitat impacted directly or indirectly by adverse effects within 250 feet of the feature.	None
Longhorn fairy shrimp	All	3.85	0.02	Not to exceed 1 acre of suitable aquatic habitat impacted directly or indirectly by adverse effects within 250 feet of the feature.	None
Riverside fairy shrimp	All	130.32	0.52	Not to exceed 1 acre of suitable aquatic habitat impacted directly or indirectly by adverse effects within 250 feet of the feature.	None
San Diego fairy shrimp	All	21.14	0.08	Not to exceed 1 acre of suitable aquatic habitat impacted directly or indirectly by adverse effects within 250 feet of the feature.	None
Vernal pool fairy shrimp	All	2,358.94	9.42	Not to exceed 25 acres of suitable aquatic habitat impacted directly or indirectly by adverse effects within 250 feet of the feature.	None
Vernal pool tadpole shrimp	All	1,200.74	4.80	Not to exceed 25 acres of suitable aquatic habitat impacted directly or indirectly by adverse effects within 250 feet of the feature.	None

Table 7. Estimated maximum impacts on covered plant species' habitats and self-imposed disturbance limits for vernal pool species.

Covered Species	Modeled Temporary Impacts (acres)	Modeled Permanent Impacts (acres)	Maximum Allowable Impacts (acres)
Baker's larkspur	45.52	0.19	N/A
Beach layia	4.38	0.02	N/A
Ben Lomond wallflower	0.69	0.00	N/A
Butte County meadowfoam	45.27	0.19	5.00
California Orcutt grass	65.84	0.27	1.00
Chorro Creek bog thistle	75.98	0.31	1.00
Coachella Valley milk-vetch	38.56	0.16	N/A
Colusa grass	20.60	0.09	5.00
Contra Costa goldfields	251.82	1.04	25.00
Cushenbury buckwheat	21.88	0.09	N/A
Few-flowered navarretia	14.92	0.06	5.00
Fleshy owl's-clover	82.83	0.34	5.00
Gentner's fritillary	19.85	0.08	N/A
Greene's tuctoria	67.63	0.28	5.00
Hairy Orcutt grass	54.01	0.22	5.00
Hoover's spurge	37.90	0.16	5.00
Howell's spineflower	2.63	0.01	N/A
Ione buckwheat	2.10	0.01	N/A
Ione manzanita	43.37	0.18	N/A
Kern mallow	89.45	0.37	N/A
Layne's butterweed	38.63	0.16	N/A

Covered Species	Modeled Temporary Impacts (acres)	Modeled Permanent Impacts (acres)	Maximum Allowable Impacts (acres)
Loch Lomond coyote thistle	6.38	0.03	1.00
Many-flowered navarretia	17.15	0.07	1.00
Menzies' wallflower	3.76	0.02	N/A
Monterey spineflower	38.80	0.16	N/A
Nipomo Mesa lupine	0.43	0.00	N/A
Palmate-bracted bird's beak	20.30	0.08	5.00
Parish's daisy	30.21	0.13	N/A
Pedate checker-mallow	1.02	0.00	N/A
Pine Hill ceanothus	2.83	0.01	N/A
Pismo clarkia	906.87	3.75	N/A
Sacramento Orcutt grass	20.06	0.08	1.00
San Bernardino bluegrass	1.01	0.00	1.00
San Diego ambrosia	41.48	0.17	N/A
San Diego button-celery	27.50	0.11	1.00
San Diego mesa-mint	10.99	0.05	1.00
San Jacinto Valley crownscale	7.27	0.03	1.00
San Joaquin Orcutt grass	45.55	0.19	5.00
San Joaquin wooly-threads	141.03	0.58	N/A
Santa Clara Valley dudleya	17.15	0.07	N/A
Santa Monica Mountains dudleya	7.54	0.03	N/A
Slender Orcutt grass	104.23	0.43	5.00
Spreading navarretia	258.64	1.07	1.00

Covered Species	Modeled Temporary Impacts (acres)	Modeled Permanent Impacts (acres)	Maximum Allowable Impacts (acres)
Stebbins’ morning-glory	2.50	0.01	N/A
Thread-leaved brodiaea	76.11	0.32	5.00

Table 8. Estimated maximum impacts to covered critical habitats.

Critical Habitat	Modeled Temporary Impacts (acres)	Modeled Permanent Impacts (acres)
Mammals		
Peninsular bighorn sheep	12.73	0.05
San Bernardino Merriam’s kangaroo rat	52.48	0.22
Birds		
Coastal California gnatcatcher	116.43	0.48
Least Bell’s vireo	58.16	0.24
Northern spotted owl	196.06	0.81
Southwestern willow flycatcher	71.33	0.30
Reptiles		
Alameda whipsnake	11.93	0.05
Amphibians		
California red-legged frog	304.74	1.26
California tiger salamander–Central Valley DPS	103.39	0.43
California tiger salamander–Santa Barbara DPS	13.57	0.07
California tiger salamander–Sonoma DPS	41.34	0.17

Critical Habitat	Modeled Temporary Impacts (acres)	Modeled Permanent Impacts (acres)
Insects		
Bay checkerspot butterfly	13.66	0.06
Quino checkerspot butterfly	31.66	0.13
Crustaceans		
Vernal pool fairy shrimp	153.54	0.64
Vernal pool tadpole shrimp	95.80	0.40
Plants		
Ash-grey paintbrush	4.39	0.02
Bear Valley sandwort	2.74	0.01
Butte County meadowfoam	18.59	0.08
Colusa grass	4.68	0.02
Contra Costa goldfields	14.99	0.06
Cushenbury buckwheat	4.78	0.02
Cushenbury milk-vetch	4.83	0.02
Cushenbury oxytheca	32.80	0.01
Fleshy owl's-clover	54.32	0.22
Greene's tuctoria	1.67	0.01
Hairy Orcutt grass	28.61	0.12
Hoover's spurge	6.27	0.03
La Graciosa thistle	31.33	0.13
Monterey spineflower	11.83	0.05
Parish's daisy	5.26	0.02

Critical Habitat	Modeled Temporary Impacts (acres)	Modeled Permanent Impacts (acres)
Sacramento Orcutt grass	20.23	0.08
San Diego ambrosia	3.35	0.01
San Joaquin Orcutt grass	28.32	0.12
Slender Orcutt grass	28.34	0.00
Southern mountain wild-buckwheat	2.74	0.00
Spreading navarretia	3.53	0.12
Vandenberg monkeyflower	5.95	0.01
Ventura Marsh milk-vetch	1.74	0.01
Yadon’s piperia	4.08	0.10
Yellow larkspur	11.08	0.00

Conservation Measures

The conservation measures described in this section of the PBO will be incorporated into the project descriptions for individual MMBN projects implemented in accordance with this PBO. Not all conservation measures may be necessary to avoid and minimize impacts, depending on the nature of the individual MMBN project. Caltrans will determine any applicable conservation measures and will include a list of these measures on the Project Notification Report used to review projects for consistency with this PBO (see the Administration of the PBO section).

This PBO uses a tiered approach to categorize projects.

- Category 1 is defined as those projects that would have insignificant or discountable effects on covered species or critical habitats with implementation of the proposed General and Category 1 conservation measures. All General and Category 1 conservation measures (guild- and species-specific) will be implemented for all covered species and critical habitats in Table 2 with an NLAA determination. For covered species and critical habitats listed in Table 1 with an LAA determination, Caltrans can implement General and Category 1 conservation measures to reduce the effects of an individual project to a Category 1 level for that covered species or critical habitat.

- Category 2 is defined as those projects that would have adverse effects on covered species or critical habitats. Category 2 would only be applicable to those covered species or critical habitats with an LAA determination in Table 1. Caltrans will implement the General and Category 1 conservation measures (guild- and species-specific) for covered species and covered critical habitats in Table 1 to the extent feasible to avoid or minimize adverse effects. When Caltrans cannot implement specific Category 1 conservation measures, those measures will be replaced by specific Category 2 conservation measures to minimize adverse effects. Each Category 2 conservation measure identifies when it will be implemented (e.g., when a work window or exclusion buffer cannot be maintained).

Species-specific conservation measures are grouped by the following taxa: mammals, birds, reptiles, amphibians, fishes, snails, insects, crustaceans, and plants.

<u>General Conservation Measures: Project Design Modifications for Avoidance and Minimization</u>

When planning, developing, and constructing individual MMBN projects in accordance with the covered activities defined in this PBOPBO, Caltrans will incorporate the following general avoidance and minimization conservation measures as applicable.

Design Measures

Caltrans will implement the following conservation measures during the planning and development of individual MMBN projects to avoid or minimize temporary and permanent impacts to covered species and critical habitats, along with suitable habitats.

BIO-1: Assessment for Covered Species Habitats and Covered Critical Habitat. Caltrans will conduct an assessment of covered species suitable habitats within the project footprint of each individual MMBN project. The habitat assessment will include identification of any critical habitat, areas of the critical habitat that contain the species-specific physical and biological features (PBFs), and suitable habitats for covered species in the project footprint (see Chapter 3 of the PBA for covered species ecological requirements; Caltrans 2023, 2024). The assessment will include a desktop screening for potential aquatic features including vernal pools and wetlands. Identification of potential aquatic features will utilize available aerial imagery, mapped known occurrences of aquatic features and relevant species, and soil series maps of the project area. Caltrans will provide all habitat assessments with the Project Notification Report.

BIO-2: Covered Species-Specific Surveys. As part of project planning, and prior to submittal of the Project Notification Report, an approved biologist (BIO-7: Approved Biologist) will conduct species-specific surveys, using most recent established protocols when available (Appendix C of the PBA, Caltrans 2023, 2024), to determine presence of covered species within the proposed project footprint. If species-specific surveys are not completed to confirm absence of covered species, the occupancy of a specific covered species within its documented range will be presumed positive based on the presence of suitable habitat. Surveys will also look for evidence (e.g., ponding, vegetation, wetland characteristics) of potential aquatic features identified during the desktop screening conducted as part of BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitat. Caltrans will provide all survey results with the Project Notification Report.

BIO-3: Design Impact Avoidance and Minimization. Caltrans will revise the design of individual MMBN projects based on the results of the habitat assessment to avoid or minimize temporary and permanent impacts to covered species, their habitats, and covered critical habitats. Caltrans will avoid installation of permanent infrastructure such as vaults and MVPs in areas with PBFs within covered critical habitat. If avoidance is not possible, then permanent disturbance would be limited to the minimum amount practicable. When avoidance is not possible, work will be monitored by approved biologist(s), BIO-7: Approved Biologist.

BIO-4: Restore Temporarily Disturbed Occupied Habitat and Covered Critical Habitat. If project activities will result in temporary impacts to occupied habitat for listed species or the covered critical habitats that contain PBFs, Caltrans will develop and submit onsite habitat restoration plans for Service, and CDFW as applicable, approval prior to project implementation.

a. Onsite habitat restoration plans will include proposed plant palettes (e.g., for hydroseeding or planting), criteria to determine when a site has been successfully restored and will include a minimum of two years of monitoring post-restoration. The 2-year monitoring requirement can only be adjusted with Service approval. Habitat restoration plans will be submitted with the Project Notification Report.
b. Upon successful completion of the actions identified in the onsite habitat restoration plans, including any restoration criteria and monitoring requirements, the Service will consider impacts to occupied habitat or the covered critical habitats that contain PBFs to

be temporary, and the 1:1 compensation requirement fulfilled (see Compensatory Mitigation Framework section).

c. If the onsite habitat restoration plans cannot be fully implemented or if Caltrans elects to not complete these actions (e.g., Caltrans cannot monitor a site for a minimum of two years), then Caltrans will describe to the Service in the Project Notification Report how it will restore the site using BIO-5: Site Restoration and will request to implement offsite compensation at a 1:1 ratio.
d. If Caltrans cannot successfully implement onsite restoration through either clauses b) or c) of this measure, then Caltrans will consider the impacts to be permanent and will compensate at a 3:1 ratio.

Additional details relevant to restoring temporarily disturbed habitat, and a definition of occupied habitat, are included in the Compensatory Mitigation Framework section of this PBO.

BIO-5: Site Restoration. Upon completion of the project, Caltrans will restore all areas subjected to temporary ground disturbance. Disturbed ground will be recontoured to its original grade and areas of bare soil created by project activities will be revegetated. Caltrans will apply hydroseed with a native plant palette appropriate to the disturbed location, re-establish salvaged plants and plant new trees, as necessary, to replace any disturbed habitat. Caltrans will coordinate with the Service on restoration actions (e.g., plant palette used in hydroseed) if requested by the Service. An area subject to temporary disturbance means any area that is disturbed during the project, but that after project completion will not be subject to further disturbance and has the potential to be revegetated.

BIO-6: Invasive Plants. Caltrans will identify areas where invasive plants, as identified in the California Invasive Plant Council (Cal IPC) Inventory, occur and will employ measures to minimize the potential for invasive plants to be introduced or spread within sensitive habitat areas including covered species habitats and covered critical habitats during construction activities. In sensitive habitat areas the following measures will be implemented:

a. Caltrans will ensure that equipment, including vehicles, tools, and personal work equipment, have been cleaned of soil, seeds, vegetative matter, and other such debris that may introduce or spread invasive species.
b. Equipment will be cleaned before operation at the job site, every time before entry to a sensitive habitat area. Equipment will not be cleaned at locations near sensitive habitat or waterways.
c. Personal work equipment, such as boots, hand tools, and any other equipment used at the job site, will be thoroughly scrubbed using a stiff-bristled brush to remove any organisms.

Implementation Measures

Caltrans will implement the following conservation measures during MMBN projects to avoid or minimize temporary and permanent impacts to covered species and critical habitats, along with suitable habitats.

BIO-7: Approved Biologist. A Service- and CDFW (if appropriate)-approved biologist(s) will conduct activities as specified in the measures below. After the start of each calendar year, and at least 7 days prior to initiating project activities, Caltrans will submit to the Service and CDFW, in writing, the name(s), resumes, and statement of qualifications for all proposed approved biologists. Proposed activities will not begin until an approved biologist has been authorized by the Service and CDFW. Approvals of biologists will be valid throughout each calendar year, up to one year, or longer if indicated by the Service and CDFW. The approved biologist(s) will be provided with a copy of this PBO and will have the authority to work with the Resident Engineer to halt construction activities that do not comply with the construction-related conservation measures. Caltrans can provide biologist qualifications with the Project Notification Report.

BIO-8: Worker Environmental Awareness Training (WEAT). Caltrans will require all construction personnel to participate in WEAT prior to participating in work activities. The training will be led by an approved biologist and delivered to all construction personnel and new field-based personnel before engaging in construction activities. The WEAT will:

a. Include descriptions of all covered species that have a reasonable likelihood of occurring in the project footprint, their habitats, and methods of identification, including visual aids as appropriate.
b. Inform staff regarding invasive plant biology, identification, and any prevention measures to avoid spreading invasive plants.
c. Describe activity-specific measures that will be implemented to avoid and minimize effects to covered species and their habitats. The measures will be provided to the Caltrans Resident Engineer and any contractors participating in construction activities.
d. Review procedures to follow in the event covered species are observed in the construction area, as described below in BIO-11: Observations of Covered Species.
e. WEAT will occur within the first week of every month. As covered activities move, WEAT will be updated to focus on relevant species expected to be encountered by activities occurring in that month.
f. Provide additional WEAT to inform crews entering sensitive habitat or other protected resource areas for the first time to remind them of pertinent conservation measures.
g. Implement a system for documenting WEAT attendance and field identification of trained workers (e.g., hardhat stickers) so that all workers performing covered activities are verified as having completed WEAT.

BIO-9: Pre-Construction Surveys. After the Project Notification Report is submitted and the Service agrees that the project is consistent with this PBO, and 7 days prior to construction, an approved biologist (BIO-7: Approved Biologist) will conduct a pre-construction survey, pedestrian and/or visual surveys as appropriate, for covered species suitable habitat and guild/ species-specific ecological requirements (ecological requirements detailed in Table 3-3 and Table 3-4 of the PBA, Caltrans 2023, 2024; additional measures detailed in *Conservation Measures for Specific Taxa* below) along the project footprint, plus a 200-foot radius if access is available. Caltrans will submit survey results to the Service with the annual programmatic report.

BIO-10: Nesting Bird Surveys. For activities initiated during the avian breeding season of February 1 through September 30, an approved biologist (BIO-7: Approved Biologist) will ensure that project activities avoid suitable nesting habitat for covered birds and conduct pre-construction surveys for other nesting birds no more than 7 days prior to the initiation of construction activities in any given area. The survey will cover the portions of the project site where construction activities will occur, as well as a 500-foot radius for the visual survey for raptors and a 250-foot radius for a visual survey for non-raptors. These surveys will only occur from within the public right-of- way and accessible areas and may not be able to cover the entire survey radius due to visual barriers. Timing of nesting surveys for covered birds must consider BIRD-1: Seasonal Avian Work Windows, which will prohibit nesting surveys for covered birds where adverse effects are to be avoided during their respective nesting season. Caltrans will submit survey results to the Service with the annual programmatic report.

BIO-11: Observations of Covered Species. If any life stage of a covered species is found during BIO-2: Covered Species-Specific Surveys, BIO-9: Pre-construction Surveys, BIO-10: Nesting Bird Surveys, guild-specific pre-construction survey conservation measures, or during project construction, the approved biologist will contact the Service within 24 hours and follow any species-specific guidance on avoidance, relocation, or salvage. If any life stage of the covered species is found in the work area during construction, the following will apply:

a. If a covered species is detected in the work area and any other areas that could have consequences from project activities, work activities will cease immediately in areas adjacent to the species, with up to a 50-foot buffer. The species will be left undisturbed and will not be relocated or harassed. The approved biologist will be notified and will assess the situation. Based on the professional judgment of the approved biologist, if project activities can be conducted without adverse consequences, the species will be left at the location of discovery and monitored.
b. Contact with the covered species will be avoided, and it will be allowed to move out of the area of its own volition. If there is an immediate hazard or if there is no suitable, accessible habitat nearby for the species to relocate to, the approved biologist will contact the Service and follow species-specific relocation plans.
c. Any new sightings of covered species will be reported to the California Natural Diversity Database (CNDDB), submitted either through the online field survey form or a hard copy of the field survey form. Caltrans will provide a copy of the reporting form and a topographic map clearly marked with the location where the covered species was observed to the Service and CDFW no more than 7 days after project completion.

BIO-12: Protections for Species and their Habitat. Caltrans will implement the following site restrictions to avoid or minimize effects on covered species and their habitat:

a. A 15 miles-per-hour speed limit will be observed in all project construction areas, except as otherwise posted when vehicles and equipment are traveling on county roads and state and federal highways.
b. Nighttime construction will be avoided to the extent practicable. If necessary, night lighting will be shielded, downward-directed, and illuminate only the work area. Work will be limited to 30 minutes after dawn and 30 minutes before dusk. If this is not practicable, Caltrans will contact the Service for additional species-specific guidance.
c. All construction-related debris, particularly food-related debris, will be disposed of in the crew's vehicles and taken offsite at the end of each workday, or stored in a closed receptacle that will not attract scavenger wildlife. Microtrash, such as bottle caps, pull-tabs, and pieces of glass, will also be removed daily.
d. All construction equipment and crew trucks will carry fire tools or other means to extinguish fires.
e. Smoking will be allowed only in designated areas equipped with sand boxes for disposal of cigarette butts.
f. The number of access routes and the size of staging and work areas will be limited to the minimum necessary to conduct the activity.
g. Firearms or pets will not be permitted on the project site.

BIO-13: Water Quality, Aquatic Features, and Vegetation Protection Measures. To minimize the potential for degradation of water quality, aquatic features, and vegetation, Caltrans will not allow work within inundated aquatic features. Caltrans will implement construction site BMPs as part of the Stormwater Pollution Prevention Plan (SWPPP) or Common SWPPP for MMBN projects. Appropriate BMPs, such as the use of temporary silt fences or fiber rolls, will be selected to prevent runoff from leaving the project site. Caltrans will also implement the following measures:

a. Prior to the onset of work, Caltrans will develop a plan for prompt and effective response to any accidental spills. The plan will include informing all workers of the importance of preventing spills and of the appropriate measures to implement should a spill occur.
b. Refueling or maintenance of vehicles or equipment will occur at least 150 feet from sensitive habitat areas, including streams/drainages and other aquatic habitat.
c. Vehicles and equipment will be checked daily for leaks, and all vehicular fluid spills will be contained and cleaned up immediately.
d. Spill containment kits will be maintained onsite at all times during construction operations and/or staging or fueling of equipment.
e. Dust control will be implemented and may include the use of water trucks and non-toxic tackifiers (binding agents) to control dust in graded areas. Dust control spray will avoid overspray into any Environmentally Sensitive Areas (ESAs) or areas outside the defined project areas.

f. For projects utilizing the HDD conduit installation method, Caltrans will submit a copy of the HDD Frac-Out Plan to the Service prior to starting HDD work.

BIO-14: Maintenance, Staging, and Storage of Equipment. Caltrans will confine all equipment maintenance, storage, and parking during construction activities to the designated construction area or to previously disturbed graded or paved areas, or level areas where grading and vegetation clearing are not required and that are not habitat for listed species, as determined in coordination with the approved biologist, BIO-7: Approved Biologist. Because fuels, lubricants, and solvents would be stored in staging areas, all staging areas would be located at least 150 feet from sensitive habitat areas, including streams/drainages and other aquatic habitat.

BIO-15: Prevent Species Entrapment. Caltrans will implement measures to prevent species entrapment including the following:

a. An approved biologist will inspect all holes, trenches, and other areas that could provide cover for wildlife species at the start of each workday. Trenches or holes will be covered at the end of each workday or have adequate means of escape (earthen ramps not more than 2:1 slope, wooden boards, etc.).
b. All pipes over four inches in diameter will be covered in such a way as to exclude wildlife from entry or stored off the ground. If this is not possible, straight pipes will be inspected for wildlife before moving or capping. Any pipes of this size that cannot be seen through completely must be covered if left overnight. Pipes under four inches in diameter will also be inspected for wildlife before moving or capping.
c. To prevent covered species from becoming entangled, trapped, or injured, non-entangling erosion control material will be used to reduce the potential for entrapment. Tightly woven fiber netting (mesh size less than 0.25 inch) or similar material will be used to ensure that wildlife are not trapped. Erosion control materials that use plastic or synthetic monofilament netting will not be used within the Action Area. This includes products that use photodegradable or biodegradable synthetic netting, which can take several months to decompose. Coconut coir matting and fiber rolls with burlap are examples of acceptable erosion control materials.

BIO-16: Wildlife Exclusion Fencing for Stationary Work Sites. When working in covered species habitat, Caltrans will install wildlife exclusion fencing in stationary work areas where construction activities or materials staging is anticipated to occur for greater than 72 hours (three days). Wildlife exclusion fencing will be placed around trenchless/HDD locations and jack and drill pits that meet these conditions. Caltrans will provide the exclusion fencing type, design, installation method, and installation strategy to the Service for review and approval with the Project Notification Report to ensure species-specific needs are included. The approved biologist will inspect the fencing before the start of each workday. The fencing will be maintained until the completion of the activity and will be removed upon completion of the activity. To prevent covered species from becoming entangled, trapped, or injured, plastic mono-filament netting, jute netting, and any material with cross joints in the netting that are bound or stitched will not be used for wildlife fencing.

Conservation Measures for Specific Taxa

The following conservation measures will be utilized during the implementation of individual MMBN projects to avoid or minimize impacts to covered species, their habitats, and covered critical habitats.

Mammal Conservation Measures

Mammal Category 1 Conservation Measures

MAM-1: Seasonal Mammalian Work Windows. Caltrans will limit activities to the following work windows (Table 9) in areas identified as suitable habitat for covered mammalian species during BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitat. Caltrans will implement Category 2 conservation measures if these seasonal work windows cannot be implemented.

Table 9. Seasonal mammalian work windows.

Species	Seasonal Mammalian Work Window
Fisher (FISHER)	July 1 – March 1
Gray wolf	October 1 – April 1
Pacific marten (PACMAR)	July 16 – March 16
Peninsular bighorn sheep (PBS)	August 1 – December 31

MAM-2: Pre-Construction Mammalian Surveys. No more than 7 days prior to the date of initial ground disturbance and vegetation clearing, an approved biologist (BIO-7: Approved Biologist) will conduct a pre-construction survey, pedestrian and/or visual surveys as appropriate, for covered mammalian species suitable habitat and potential burrows/burrow complexes/dens along the project footprint, plus a 200-foot radius if access is available. Caltrans will submit survey results to the Service with the annual programmatic report.

MAM-3 Suitable Habitat and Burrow/Burrow Complex Exclusion Buffers. Caltrans will avoid suitable habitat, burrow complexes, and dens discovered for covered mammalian species during MAM-2: Pre-Construction Mammalian Surveys. An approved biologist (BIO-7: Approved Biologist) will establish a species-specific exclusion buffer around suitable habitat, burrow complexes, and dens (see Table 10). The approved biologist will advise Caltrans of appropriate methods to limit disturbance of covered species within these buffers. Caltrans will implement Category 2 conservation measures if work within these buffers cannot be limited to insignificant or discountable effects, or the buffers cannot be implemented.

Table 10. Suitable mammal habitat and burrow/burrow complex exclusion buffers.

Species	Suitable Habitat and Burrow/Burrow Complex Exclusion Buffers
Buena Vista Lake shrew	100 feet around suitable habitat
Fisher (FISHER)	200 feet around suitable habitat
Giant kangaroo rat	50 feet around suitable burrows/burrow complexes
Pacific marten (PACMAR)	200 feet around suitable habitat
Pacific pocket mouse	50 feet around suitable burrows
Peninsular bighorn sheep (PBS)	1,500 feet around any observed individuals
Point Arena Mountain beaver (PAMB)	See PAMB-1 and PAMB-2
Riparian brush rabbit	250 feet around suitable habitat
Riparian woodrat	250 feet around suitable habitat
San Bernardino Merriam's kangaroo rat (SBM)	50 feet around suitable burrows/burrow complexes
San Joaquin kit fox	50 feet for potential dens, 100 feet for known dens, 200 feet for natal dens
Stephen's kangaroo rat	50 feet around suitable burrows/burrow complexes
Tipton kangaroo rat	50 feet around suitable burrows/burrow complexes

MAM-4: Biological Monitor and Daily Clearance Surveys. An approved biologist (BIO-7: Approved Biologist) will be onsite during all ground-disturbing activities within covered mammalian species suitable habitat. The approved biologist will conduct daily clearance surveys at the beginning of each day and regularly throughout the workday, and during ground disturbing activities. The approved biologist will monitor any implemented exclusion buffers, MAM-3: Suitable Habitat and Burrow/Burrow Buffers Exclusion Buffers, and check potential, atypical, and known burrows/burrow complexes/dens every two weeks when construction activities are occurring in suitable habitat for covered mammals.

MAM-5: Biological Escort. An approved biologist (BIO-7: Approved Biologist) will always accompany all construction-related activities in suitable habitat for the following covered mammals:

- Buena Vista Lake ornate shrew
- Giant kangaroo rat
- Pacific pocket mouse
- Peninsular bighorn sheep
- Salt marsh harvest mouse
- San Bernardino Merriam's kangaroo rat

- Stephen’s kangaroo rat
- Tipton kangaroo rat

MAM-6: Rain Limitations. Caltrans will cease project activities on days with rainfall equal to or greater than 0.5 inch during a 24-hour period, or a forecast predicting this level of rain within areas identified as habitat for covered mammals. Construction activities halted due to precipitation may resume when precipitation ceases, and when the National Weather Service 72-hour weather forecast indicates less than a 50 percent chance of 0.5 inch of rain or less during a 24-hour period. Before construction activities resume, the approved biologist will inspect the project area and all equipment/materials for the presence of covered mammals.

Mammal Species-Specific Category 1 Conservation Measures

FISHER/PACMAR-1: Avoid Removal of Important Habitat Structures for Fisher and Pacific Martin. Caltrans will avoid removal of important habitat structures for fisher and Pacific marten in suitable habitat. Important habitat structures include: conifers greater than 30 inches diameter at breast height (dbh); hardwoods greater than 20 inches dbh; all conifer snags greater than 35 inches dbh, all hardwood snags greater than 27 inches dbh, large trees greater than 24 inches dbh with deformities, broken tops, large branches, and cavities.

PAMB-1: Habitat Avoidance Buffers in Unoccupied Suitable Point Arena Mountain Beaver Habitat. Caltrans will consider areas to be unoccupied suitable Point Arena mountain beaver habitat if BIO-2: Covered Species-Specific Surveys determines an area is unoccupied. Conduit installation using any method may be used in unoccupied suitable habitat provided it occurs at least 50 feet from known occupied habitat. HDD will be used within unoccupied suitable habitat if it occurs within 50 feet of occupied habitat. Caltrans will minimize vegetation removal or alteration in unoccupied suitable habitat within 50 feet of occupied habitat to the greatest extent practicable.

SMHM-1: Avoid Salt Marsh Harvest Mouse During Vegetation Removal. Caltrans will remove vegetation within suitable habitat for the salt marsh harvest mouse to bare ground or stubble no higher than 1 inch by using hand tools with an approved biologist (BIO-7: Approved Biologist) present. The approved biologist will survey the vegetation removal area ahead of the vegetation clearing. Vegetation will be cut starting at the outside edge (nearest unvegetated or disturbed areas) working outward toward the edge of the project footprint to allow wildlife the opportunity to escape toward appropriate cover. Vegetation (except for non-native, invasive species) will immediately be removed from the cleared area as it is being cut out, so that no standing or cut vegetation remains in the cleared area. If harvest mice are encountered during vegetation clearing or other activities, work will be halted until the individual has left the area on its own due to the difficulty with field identification of salt marsh harvest mice, this will apply to all harvest mice.

SMHM-2. Avoid Work at High Tides in Salt Marsh Harvest Mouse Habitat. Caltrans will not perform work activities in or adjacent to salt marsh harvest mouse tidal marsh habitat within two hours (before or after) of high tides 6.5 feet or above measured at the Golden Gate Bridge and adjusted to the timing of local high tides. Current and predicted tides measured at the Golden Gate Bridge can be accessed via the National Oceanic and Atmospheric Administration (NOAA) website.

SBM-1. Conduit Installation Method Restrictions on I-210 for San Bernardino Merriam's Kangaroo Rat. Caltrans will attach the conduit to the bridge structures on I-210 at the Santa Ana River Wash and Lytle/Cajon Wash to avoid impacts to San Bernardino Merriam's kangaroo rat at these locations.

Mammal Category 2 Conservation Measures

The mammalian species that Category 2 conservation measures can be applied to include Buena Vista Lake ornate shrew, giant kangaroo rat, peninsular bighorn sheep, Point Arena mountain beaver, San Bernardino Merriam's kangaroo rat, Stephen's kangaroo rat, and Tipton kangaroo rat (see Table 1). The peninsular big horn sheep and salt marsh harvest mouse are California Fully Protected species, and Point Arena mountain beaver is susceptible to mortality during capture and relocation efforts; therefore, Caltrans will not implement MAM-7: Mammalian Species Relocation Plan for these species.

MAM-7: Mammalian Species Relocation Plan. Caltrans will prepare a relocation plan for covered species with a project-level determination of LAA if surveys confirm that the covered species is present, or if surveys are not done but the project footprint is in suitable habitat. If a covered species is present, or presumed present, but individuals are not reasonably likely to occur within the project footprint, then Caltrans may forego preparing a relocation plan with the written approval of the Service. The covered species relocation plan will be reviewed and approved by the Service, and CDFW as applicable, as part of the Project Notification Report. The plan will include capture and relocation methods, relocation site, and post-relocation monitoring, if applicable. Only an approved biologist (BIO-7: Approved Biologist) will capture, handle, and relocate covered species. The plan will also identify engineering controls to prevent covered species recolonization of the project footprint and provide a schedule of construction and translocation activities, as applicable. Covered mammals will be handled and assessed according to the protocols issued by the Service, including the Survey Protocol for Determining Presence of San Joaquin Kangaroo Rats (Service 2013), and will follow standard small mammal live trapping and handling guidelines by an approved biologist. Peninsular big horn sheep and salt marsh harvest mouse will not be handled due to their status as California Fully Protected species. Trapping will not be conducted if the nightly low temperature is forecast to be below 50 degrees Fahrenheit or if extended wind, rain, fog, or other inclement weather make (or have made) conditions unsuitable for trapping or would unduly injureinjure captured animals. An approved biologist will release any covered mammals detected in the project footprint in habitat located outside of the work area or will work with the Resident Engineer to stop work until the animal has left the area. Caltrans will notify the Service, and CDFW as applicable, within 24 hours of any covered species relocations. *Note:* This measure is not applicable to the Point Arena Mountain Beaver, peninsular big horn sheep, and salt marsh harvest mouse.

Mammal Species-Specific Category 2 Conservation Measures

KRAT-1: Biological Monitor for Kangaroo Rat Burrow Complex Avoidance Buffer. If MAM-3: Suitable Habitat and Burrow/Burrow Complex Exclusion Buffers cannot be implemented for giant kangaroo rat, San Bernardino kangaroo rat, Stephen's kangaroo rat, or Tipton kangaroo detected during MAM-2: Pre-Construction Mammalian Surveys, an approved biologist (BIO-7: Approved Biologist) will establish a 50-foot avoidance buffer around all active and potentially active burrow complexes. The approved biologist will advise Caltrans of appropriate methods to limit disturbance to kangaroo rat burrow and burrow complexes, such as implementing MAM-7: Mammalian Species Relocation Plan and will monitor burrows and burrow complexes for disturbance if work occurs within these buffers. Other appropriate methods could include work within compacted soils adjacent to the roadway or the use of other installation methods (e.g., trenching in pavement).

PAMB-2: Construction Methods in and Adjacent to Occupied Suitable Point Arena Mountain Beaver Habitat. Areas will be determined to be occupied suitable Point Arena mountain beaver habitat if BIO-2: Covered Species-Specific Surveys confirms occupancy or if surveys are not conducted and occupancy is assumed. Construction methods will be limited to the following:

- HDD with a minimum depth of 10 feet will be used to install conduit in all areas where PAMB occur within 20 feet of the highway, as determined by the surveys, or in areas previously known to contain active PAMB burrow systems that have been delineated as Caltrans' ESAs for the PAMB (two PAMB ESAs occur on State Route (SR) 1).
- HDD drilling pits will be located at least 50 feet from occupied PAMB habitat. If a PAMB occupied area is longer than the maximum distance HDD can cover (approximately 1000 feet) then the 50-foot avoidance distance for pits may be reduced with authorization from the Service. Alternate pit locations will be determined through an intensive PAMB survey to ensure active PAMB burrow systems are avoided.
- Pull and splice vaults will be placed at least 50 feet from occupied PAMB habitat.
- Network hubs will be placed no closer than 200 feet from occupied PAMB habitat.
- Equipment and personnel must be confined to the asphalt roadway adjacent to occupied PAMB habitat.

PBS-1: Minimize Noise Disturbance to Peninsular Bighorn Sheep. If MAM-1: Seasonal Mammalian Work Windows cannot be implemented (Table 9), Caltrans will minimize the use of heavy equipment that causes loud noises if work occurs from January 1 through June 30 within suitable habitat for peninsular bighorn sheep.

Avian Conservation Measures

Avian Category 1 Conservation Measures

BIRD-1: Seasonal Avian Work Windows. Caltrans will limit all project activities, including BIO-10: Nesting Bird Surveys to the following work windows (Table 11) in areas identified as suitable habitat for covered birds during BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitat. Caltrans will implement Category 2 conservation measures if these seasonal work windows cannot be implemented.

Table 11. Seasonal avian work windows.

Species	Seasonal Avian Work Window
California clapper rail (CCR)	September 1 to January 31
Coastal California gnatcatcher (CAGN)	September 1 to February 14
California least tern	October 1 to March 1 when north of the Monterey/San Luis Obispo County line, and September 16 to March 31 when south of the Monterey/San Luis Obispo County line
California spotted owl-Sierra Nevada DPS	September 15 to January 31
California spotted owl-Coastal-Southern California DPS	September 15 to January 31
Least Bell's vireo (LBV)	September 16 to March 14
Light-footed Ridgway's rail (LFR)	September 1 to January 31
Marbled murrelet (MAMU)	August 6 to March 24
Northern spotted owl (NSO)	September 15 to January 31
Southwestern willow flycatcher	September 1 to March 1
Western snowy plover (WSP)	September 1 to February 28
Yellow-billed cuckoo	August 16 to June 15
Yuma Ridgway's rail (YRR)	October 1 to February 15

Avian Species-specific Category 1 Conservation Measures

CCR/LFR/YRR-1: Pre-Construction California Clapper Rail, Light-footed Ridgway's Rail, and Yuma Ridgway's Rail Surveys During Non-Breeding Season. During the seasonal work window, BIRD-1: Seasonal Avian Work Windows, (Table 11), an approved biologist, BIO-7 Approved Biologist, will conduct a pre-construction survey for suitable California clapper rail, light-footed Ridgway's rail, and Yuma Ridgway's rail habitat within 7 days prior to the commencement of construction activities. Caltrans will submit survey results to the Service with the annual programmatic report.

CCR/LFR/YRR-2: Avoidance Buffer for Suitable California Clapper Rail, Light-footed Ridgway's Rail, and Yuma Ridgway's Rail Habitat During Non-Breeding Season. Caltrans will implement an avoidance buffer of 700 feet around identified suitable California clapper rail, light-footed Ridgway's rail, and Yuma Ridgway's rail habitat observed during CCR/LFR/YRR-1: Pre-Construction California Clapper Rail, Light-footed Ridgway's rail, and Yuma Ridgway's Rail Surveys During Non-Breeding Season. Within this avoidance buffer, work can occur on the opposite side of the roadway from suitable habitat with an approved biologist present.

CCR/LFR/YRR-3: Biological Monitor and Daily Pre-Construction California Clapper Rail, Light-footed Ridgway's rail, and Yuma Ridgway's Rail Surveys During Non-Breeding Season. An approved biologist (BIO-7: Approved Biologist) will be present for all activities and conduct daily pre-construction surveys for California clapper rail, light-footed Ridgway's rail, and Yuma Ridgway's rail when work occurs within suitable habitat during the non-breeding season (Table 11).

CCR/LFR-1: Avoid Work at High Tides in California Clapper Rail and Light-footed Ridgway's Rail Habitat Year-Round. Caltrans will not perform project activities in or near a tidal marsh area, or activities in or adjacent to suitable California clapper rail habitat or light-footed Ridgway's rail habitat year-round within two hours before or after high tides, defined as 6.5 feet or above measured at the nearest tide gauge and adjusted to the timing of local high tides. Current and predicted tides and currents measured at the nearest monitoring station can be accessed via the NOAA website at the following link, https://tidesandcurrents.noaa.gov/map/index.shtml?lat=36.37410569300005&lng=-119.27022999999997&zoom=10.

CAGN-1: Avoid Coastal California Gnatcatcher Disturbance During Vegetation Removal Year-Round. An approved biologist (BIO-7: Approved Biologist) will perform focused surveys the day immediately prior to the initiation of clearing and grubbing to determine the presence of Coastal California gnatcatcher in the project footprint year-round. If any Coastal California gnatcatcher individuals are found in the project footprint, the approved biologist will direct construction personnel to begin clearing and grubbing at least 50 feet away from the Coastal California gnatcatcher. Clearing and grubbing may continue when the gnatcatcher individual leaves the area. Caltrans will submit survey results to the Service with the annual programmatic report.

LBV-1: Avoid Riparian Habitat for Least Bell's Vireo Disturbance. Caltrans will avoid all mature riparian vegetation that is suitable habitat for least Bell's vireo, defined as riparian willows, cottonwoods, or other shrubs and trees. Caltrans will minimize any trimming or removal of this habitat and restrict trimming or removal to the seasonal work window for least Bell's vireo of September 16 to March 14.

MAMU-1: Prohibit Removal of Known or Potential Marbled Murrelet Nest Trees. Caltrans will not remove potential marbled murrelet nest trees at any time of the year. Potential nest trees for marbled murrelet are defined as mature, with or without an old-growth component, and old-growth coniferous forests; younger coniferous forests that have platforms defined as relatively flat, with branches at least 4 inches in diameter, and at least 33 feet above the base of the live crown of a coniferous tree. Trimming or pruning of unsuitable nest trees or limbs, trimming or removal of brush, and felling trees in suitable habitat may occur within the seasonal work window for marbled murrelet of September 15 to March 24.

OWL-1: Prohibit Removal of Known Spotted Owl Nest Trees. Caltrans will not remove or damage any known California spotted owl and northern spotted owl known nest trees, trees or snags with potential nesting platforms, or snags 20 inches dbh or larger at any time of the year. Nesting trees are typically trees with large, flattened tops; large, broken-topped trees; trees with decadence, such as large cavities; mistletoe broom structures, catfaces, or large limbs; or large snags with these similar characteristics.

OWL-2: Minimize Disturbance of Nesting, Roosting or Foraging Spotted Owl Habitat. If nesting, roosting, or foraging habitat is removed or altered outside of the spotted owl nesting season (i.e., from September 16 through January 31), Caltrans will ensure that the habitat remains functional for spotted owl nesting, roosting, or foraging.

WSP-1: Western Snowy Plover Pre-construction Surveys during Non-Breeding Season. During the seasonal work window, BIRD-1: Seasonal Avian Work Windows (Table 11), an approved biologist (BIO-7: Approved Biologist) will conduct surveys within all suitable wintering habitat for western snowy plover in the project footprint and within a 50-foot buffer around the project footprint no more than 7 days prior to proposed work activities. If no plovers are detected, work will proceed without restrictions. Surveys will be conducted weekly thereafter, and work may proceed without restrictions if plovers are not detected. If one or more plovers are detected during a weekly survey, daily pre-activity plover surveys will be started. If no plovers are detected during a daily pre-work survey, work may proceed without restrictions during that day. If plovers are detected, work will stop immediately and not begin again until an approved biologist has determined that the plovers have vacated the survey area. If no plovers are detected for 7 consecutive days, daily surveys will be replaced by weekly surveys until plovers are detected again. Caltrans will submit survey results to the Service with the annual programmatic report.

WSP-2: Protect Wintering Western Snowy Plover Habitat at Silver Strand Beach. Caltrans will limit work activities to the east side of the Silver Strand State Beach/State Route 75 to avoid and protect western snowy plovers present along the west side of State Route 75.

COND-1: Conduit Installation Method Restrictions in California Condor Habitat. Caltrans will not install conduit on utility poles within suitable California condor habitat.

Avian Category 2 Conservation Measures

If Caltrans cannot implement BIRD-1 Seasonal Avian Work Windows, Category 2 conservation measures will be applied to California clapper rail, Yuma Ridgway's rail, Coastal California gnatcatcher, California spotted owl-Sierra Nevada DPS, California spotted owl-Coastal-Southern California DPS, least Bell's vireo, Northern spotted owl, and Southwestern willow flycatcher.

BIRD-2: Pre-construction Nest and Suitable Habitat Surveys. An approved biologist (BIO-7: Approved Biologist) will conduct nest and suitable nesting habitat surveys no more than 7 days prior to the date of initial ground disturbance and vegetation clearing. These surveys may occur concurrently with BIO-10: Nesting Birds Surveys. During the surveys, the approved biologist will look for active nests and nesting habitat along the project alignment, as well as a 50-foot radius for non-owl species and a 0.25-mile radius for owl species, as accessible. See CCR/YRR-1: Pre-Construction Surveys and Suitable Exclusion Buffers during California Clapper Rail and Yuma Ridgway's Rail Breeding Season for California clapper rail and Yuma Ridgway's rail pre-construction survey requirements. Caltrans will submit survey results to the Service with the annual programmatic report.

BIRD-3: Nesting Habitat and Nest Exclusion Buffers. If potentially active nests or nesting habitat are located during BIRD-2: Pre-construction Nest and Suitable Habitat Surveys, an approved biologist (BIO-7: Approved Biologist) will establish an exclusion buffer (see Table 12). Caltrans will not allow project activities within potential active nest or nesting habitat buffers. Work may proceed once an approved biologist has confirmed that the nest is inactive, or the Service authorizes activities within suitable buffers.

Table 12. Active nest and habitat exclusion buffers for covered avian species.

Species	Active Nest or Nesting Habitat Exclusion Buffers
Coastal California gnatcatcher	300-foot buffer around active nests
California clapper rail	See CCR/YRR-1
Yuma Ridgway's rail	See CCR/YRR-1
California spotted owl-Sierra Nevada DPS	500-foot buffer around active nests
California spotted owl-Coastal-Southern California DPS	500-foot buffer around active nests
Least Bell's vireo	250-foot buffer around active nest
Northern spotted owl	500-foot buffer around active nests
Southwestern willow flycatcher	500-foot buffer around nesting habitat

BIRD-4: Biological Monitor and Daily Nesting Monitoring Surveys. An approved biologist (BIO-7: Approved Biologist) will be onsite during all vegetation management or ground-disturbing activities and will monitor active nests and/or suitable nesting habitat buffers (Table 12) for potential disturbance. Caltrans will submit survey results to the Service with the annual programmatic report.

Avian Species-Specific Category 2 Conservation Measures

CCR/YRR-1: Pre-Construction Surveys and Suitable Exclusion Buffers during California Clapper Rail and Yuma Ridgway's Rail Breeding Season. If construction occurs during the breeding season (February 1 to September 30) in suitable habitat for California clapper rail or Yuma Ridgway's rail, an approved biologist (BIO-7: Approved Biologist) possessing a 10(a)1(A) permit for California clapper rail or Yuma Ridgway's rail will conduct a pre-construction survey prior to any project activities occurring within 700 feet of those habitats. Survey requirements will follow the Service's (2015, 2017a) protocols for California clapper rail and Yuma Ridgway's rail. If a rail is detected, or if these protocols are not conducted and presence is presumed, project activities will not occur within 700 feet of identified occupied or suitable habitat until Caltrans coordinates with the Service and CDFW regarding appropriate avoidance measures, and permission is granted by the Service and CDFW to commence work. Caltrans will submit survey results to the Service with the annual programmatic report.

OWL-3: Partial Breeding Season Restrictions on Activities within Visual Range of Known or Potential Spotted Owl Nest Trees. No project activities will occur within a visual line-of-sight of 328 feet (100 meters) or less from any known nest tree or from unsurveyed nesting/roosting habitat containing potential owl nest trees within 328 feet of activities proposed to occur during most of the owl nesting season (i.e., February 1 through July 31). These visual disturbance restrictions will be lifted after July 31. The 328-feet visual disturbance distance may be reduced or eliminated only if the Service authorizes activities within suitable buffers.

OWL-4: Avoid Modification of Spotted Owl Nesting Habitat within Breeding Season. Caltrans will not modify suitable nesting/roosting habitat for California spotted owl and northern spotted owl between February 1 and September 15. Modification includes cutting and removal of large trees, downed logs, or snags. Caltrans will not remove or alter known nest trees. Tree or limb trimming or pruning, brush trimming or removal, and hazard tree felling may occur if the noise levels described in OWL-5: Partial Spotted Owl Breeding Season Noise Buffers Around Active Nests are not exceeded during the part of the owl breeding period of February 1 through July 31.

OWL-5: Partial Spotted Owl Breeding Season Noise Buffers Around Active Nests. Caltrans will not conduct activities that result in loud or continuous noise 20 or more decibels (dB) above ambient sound levels within 0.25 mile (1,320 feet) of an active nest site for California spotted owl and northern spotted owl between February 1 and July 31. This includes activities that generate maximum sound levels above 90 dB, excluding vehicle back-up alarms. Maximum sound levels are the combined ambient and project-generated sound levels.

OWL-6: Partial Spotted Owl Breeding Season Noise Minimization. During most of the owl nesting season (i.e., from February 1 through July 31), Caltrans will reduce noise from project activities to the greatest extent practicable and will not exceed 20 dB above ambient sound levels. When project activities are adjacent to owl nesting/roosting habitat, Caltrans will not generate noise above 90 dB. These noise restrictions will be lifted after July 31.

NSO-1: Minimize Northern Spotted Owl Critical Habitat Disturbance. When working in designated critical habitat for the northern spotted owl, Caltrans will adhere to all Category 1 and 2 Conservation Measures applicable to northern spotted owl for reducing impacts in suitable nesting, roosting, or foraging habitat.

Reptile Conservation Measures

Reptile Category 1 Conservation Measures

REP-1: Seasonal Reptile Work Windows. Caltrans will limit all activities to the following work windows (Table 13) in areas identified as suitable habitat for covered reptiles during BIO-1: Assessment for Covered Species Habitats and Covered Critical Habitat. Caltrans will implement Category 2 conservation measures if these seasonal work windows cannot be implemented.

Table 13. Seasonal reptile work windows.

Species	Seasonal Reptile Work Windows
Alameda whipsnake (AWS)	June 15 to October 31
Coachella Valley fringe-toed lizard (CVFTL)	April 1 to September 30
Giant garter snake (GGS)	May 1 to October 1
San Francisco garter snake (SFGS)	May 1 to October 30

REP-2: Pre-Construction Reptile Surveys. No more than 7 days prior to the date of initial ground disturbance and vegetation clearing, an approved biologist (BIO-7: Approved Biologist) will conduct a pre-construction survey along the project footprint plus a 50-foot radius if access is available. Surveys will include a thorough investigation of mammal burrows, rocks, soil cracks, vegetation, logs, and any other debris (e.g., leaf litter) identified as potential refuge burrows or cover habitat. Caltrans will submit survey results to the Service with the annual programmatic report.

REP-3: Biological Monitor and Daily Clearance Surveys. An approved biologist (BIO-7: Approved Biologist) will be onsite during all ground-disturbing and vegetation clearing activities within suitable habitat for covered reptiles. The approved biologist will conduct daily clearance surveys of all equipment, vehicles, and stockpiled materials at the beginning of each day and regularly throughout the workday when construction activities are occurring. An approved biologist will accompany all construction-related activities in suitable habitat for all covered reptiles.

REP-4: Minimize Vegetation Removal and Ground Disturbance Impacts to Covered Reptile Species. Before any vegetation removal or ground disturbance is conducted, an approved biologist (BIO-7: Approved Biologist) will conduct visual surveys for covered reptiles. An approved biologist will monitor vegetation removal and ground disturbance activities within suitable habitat for covered reptiles. All vegetation cleared from the site will be removed from the site the same day. No cleared vegetation will be stored onsite.

REP-5: Rain Limitations. Caltrans will cease project activities on days with rainfall equal to or greater than 0.5 inch during a 24-hour period, or a forecast predicting this level of rain within areas identified as habitat for covered reptile species. Construction activities halted due to precipitation may resume when precipitation ceases, and the National Weather Service 72-hour weather forecast indicates less than a 50 percent chance of 0.5 inch of rain or less during a 24-hour period. Before construction activities resume, the approved biologist will inspect the project area and all equipment/materials for the presence of covered reptiles.

Reptile Species-specific Category 1 Measures

All conservation measures identified below with the prefix "WPT" will be applied to the northwestern pond turtle and the southwestern pond turtle.

AWS-1: Alameda Whipsnake Rocky Habitat Avoidance. Caltrans will avoid all rock outcroppings within suitable Alameda whipsnake habitat. No ground disturbance and vegetation clearing in Alameda whipsnake scrub/chaparral habitat will occur.

BNLL-1: Air Temperature Work Restriction for Blunt-nosed Leopard Lizard. Caltrans will limit activities within suitable blunt-nosed leopard lizard habitat to when the air temperature is above 78.8 degrees Fahrenheit.

BNLL-2: Burrow Avoidance and Exclusion Buffer for Blunt-Nosed Leopard Lizard. Caltrans will avoid potential refuge blunt-nosed leopard lizard burrows or cover sites discovered during REP-2: Pre-Construction Reptile Surveys. An approved biologist will establish 50-foot exclusion buffers around burrows. No work will occur within the buffer.

CVFTL-1: Ground Temperature Work Restriction for Coachella Valley Fringe-toed Lizard. Caltrans will limit activities within suitable Coachella Valley fringe-toed lizard habitat to when the ground temperature is between 96 and 104 degrees Fahrenheit.

GGS-SFGS-1: Aquatic Habitat Buffer for Giant Garter Snake and San Francisco Garter Snake. To limit impacts near suitable aquatic habitat for giant garter snake and San Francisco garter snake, Caltrans will designate a 250-foot buffer of aquatic habitat as an ESA on plans and in the field. An approved biologist (BIO-7: Approved Biologist) will establish the 250-foot buffer in the field. The approved biologist will advise Caltrans of appropriate methods to limit disturbance of covered species within these buffers and will monitor these buffers to ensure BIO-12: Protections for Species and their Habitat, BIO-13: Water Quality, Aquatic Features, and Vegetation Protection Measures, and BIO-14: Maintenance, Staging, and Storage of Equipment conservation measures are implemented immediately outside the buffer and adjacent to aquatic features.

WPT-1: Western Pond Turtle Habitat Avoidance. Caltrans will avoid all suitable upland habitat within 1,650 feet of suitable aquatic western pond turtle habitat. No ground disturbance and vegetation clearing in upland western pond turtle habitat will occur.

Reptile Category 2 Conservation Measures

The reptile species that Category 2 conservation measures can be applied to are Alameda whipsnake, Coachella Valley fringe-toed lizard, Giant garter snake, northwestern pond turtle, San Francisco garter snake, and southwestern pond turtle. The blunt-nosed leopard lizard and San Francisco garter snake are California Fully Protected species and handling or implementation of REP-6: Reptile Species Relocation Plan is prohibited.

REP-6: Reptile Species Relocation Plan. Caltrans will prepare a relocation plan for covered species with a project-level determination of LAA if surveys confirm that the covered species is present, or if surveys are not done but the project footprint is in suitable habitat. If a covered species is present, or presumed present, but individuals are not reasonably likely to occur within the project footprint, then Caltrans may forego preparing a relocation plan with the written approval of the Service. The covered species relocation plan will be reviewed and approved by the Service, and CDFW as applicable, as part of the Project Notification Report. The approved plan will include capture and relocation methods, relocation site (i.e., species-specific relocation site parameters and distances, and post-relocation monitoring, if applicable. Only an approved biologist (BIO-7: Approved Biologist) will capture, handle, and relocate covered species. The plan will also identify engineering controls to prevent covered species recolonization of the project footprint and provide a schedule of construction and translocation activities, as applicable. Trapping will not be conducted if weather conditions are unsuitable for trapping or would increase the risk of injury to captured animals. Covered species will be handled and assessed according to established protocols issued by the Service and CDFW. The blunt-nosed leopard lizard and San Francisco garter snake will not be handled due to its status as a California Fully Protected species. The approved biologist will relocate and release individuals to habitat located outside of the work area or will work with the Resident Engineer to stop work until the animal has left the area. Caltrans will notify the Service within 24 hours of any covered species relocations. *Note:* this measure is not applicable to the blunt-nosed leopard lizard and San Francisco garter snake.

GGS-1: Minimize Giant Garter Snake Habitat Disturbance. If Caltrans cannot implement REP-1: Seasonal Reptile Work Windows and work occurs outside of the seasonal work window (May 1 to October 1) and within the 250-foot avoidance buffer of suitable aquatic habitat for giant garter snake, GGS-/SFGS-1: Aquatic Habitat Avoidance Buffer for Giant Garter Snake and San Francisco Garter Snake, Caltrans will limit disturbance to existing grades and vegetation to the actual site of the project footprint and necessary access routes. Caltrans will site staging areas and other facilities to limit disturbance to suitable habitat for giant garter snake. An approved biologist (BIO-7: Approved Biologist) will monitor these buffers to ensure BIO-12: Protections for Species and their Habitat, BIO-13: Water Quality, Aquatic Features, and Vegetation Protection Measures, and BIO-14: Maintenance, Staging, and Storage of Equipment conservation measures are implemented within the buffer and adjacent to aquatic features.

SFGS-1: Minimize San Francisco Garter Snake Habitat Disturbance. If Caltrans cannot implement REP-1: Seasonal Reptile Work Windows and work occurs outside of the seasonal work window and within the 250-foot avoidance buffer of suitable habitat for San Francisco garter snake, GGS-SFGS-1: Aquatic Habitat Avoidance Buffer for Giant Garter Snake and San Francisco Garter Snake, an approved biologist (BIO-7: Approved Biologist) will mark all potential refugia and burrows and implement a 10-foot exclusion buffer. An approved biologist will monitor these buffers to ensure BIO-12: Protections for Species and their Habitat, BIO-13: Water Quality, Aquatic Features, and Vegetation Protection Measures, and BIO-14: Maintenance, Staging, and Storage of Equipment conservation measures are implemented within the buffer and adjacent to aquatic features.

WPT-2: Minimize Western Pond Turtle Habitat Disturbance. If work occurs within the 1650-foot avoidance buffer of suitable aquatic habitat for western pond turtle, WPT-1: Western Pond Turtle Habitat Avoidance, an approved biologist (BIO-7: Approved Biologist) will mark all observed nests and aestivating locations (April 15 to September 30), as well as overwintering (e.g., leaf litter) locations (October 1 to April 14) and implement a 50-foot exclusion buffer. An approved biologist will monitor these buffers to ensure BIO-12: Protections for Species and their Habitat, BIO-13: Water Quality, Aquatic Features, and Vegetation Protection Measures, and BIO-14: Maintenance, Staging, and Storage of Equipment conservation measures are implemented within the buffer and adjacent to aquatic features.

Amphibian Conservation Measures

Amphibian Category 1 Conservation Measures

AMPH-1: Seasonal Amphibian Work Windows. Caltrans will limit all activities to the following seasonal work windows (Table 14) in areas identified as suitable habitat for covered amphibian species during BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitat. Category 2 conservation measures described below will be implemented if work within seasonal windows cannot be implemented.

Table 14. Seasonal amphibian work windows.

Species	Seasonal Amphibian Work Windows
California red-legged frog	May 1 – October 31
California tiger salamander, Central California Coast DPS (CTS), Sonoma DPS (CTS), California tiger salamander, Santa Barbara DPS (CTS)	See CTS-3
Santa Cruz long-toed salamander	April 15 – October 15
Sierra Nevada yellow-legged frog	August 1 – October 1
Western spadefoot – northern DPS (WSF)	See CTS/WSF-3
Western spadefoot – southern DPS (WSF)	See CTS/WSF-3
Yosemite toad (YOTO)	August 1 – October 1

AMPH-2: Pre-Construction Amphibian Surveys. An approved biologist (BIO-7: Approved Biologist) will conduct a pre-construction survey for covered amphibians within the project footprint no more than 7 days prior to the date of initial ground disturbance and vegetation clearing. This includes a thorough investigation of burrows, rocks, soil cracks, vegetation, logs, and any other debris or other species-appropriate habitat features that could serveas potential refuge habitat. If potential aestivation burrows are discovered, the approved biologist will monitor burrows during all project activities. Caltrans will submit survey results to the Service with the annual programmatic report.

AMPH-3: Biological Monitor and Daily Clearance Surveys. An approved biologist (BIO-7: Approved Biologist) will be onsite during all ground-disturbing and vegetation removal activities. The approved biologist will conduct daily clearance surveys of all equipment, vehicles, and stockpiled materials at the beginning of each day and regularly throughout the workday when construction activities are occurring.

AMPH-4: Amphibian Aquatic Habitat Avoidance and Minimization Buffer. To avoid impacts to suitable aquatic breeding habitat for covered amphibians, Caltrans will designate a 250-foot avoidance buffer of these areas as an ESA on plans and in the field. The approved biologist will establish these buffers in the field and will advise Caltrans of appropriate methods to limit disturbance of covered amphibians within these buffers. Vegetation will be cleared by hand within the aquatic habitat buffer. Caltrans will implement Category 2 conservation measures when work within these buffers cannot be limited to insignificant or discountable effects, or the buffers cannot be implemented. The approved biologist will ensure BIO-12: Protections for Species and their Habitat, BIO-13: Water Quality, Aquatic Features, and Vegetation Protection Measures, and BIO-14: Maintenance, Staging, and Storage of Equipment are implemented outside the buffer and adjacent to aquatic features.

AMPH-5: Rain Limitations. Caltrans will cease project activities on days with rainfall equal to or greater than 0.5 inch during a 24-hour period, or a forecast predicting this level of rain within areas identified as habitat for covered amphibians. Construction activities halted due to precipitation may resume when precipitation ceases, and the National Weather Service 72-hour weather forecast indicates less than a 50 percent chance of 0.5 inch of rain or less during a 24-hour period. Before construction activities resume, the approved biologist (BIO-7: Approved Biologist) will inspect the project area and all equipment/materials for the presence of covered species amphibians.

Amphibian Species-specific Category 1 Measures

All conservation measures identified below with the prefix “CTS” will be applied to all three DPS of the California tiger salamander. All conservation measures identified below with the prefix “WSF” will be applied to both DPSs of the western spadefoot.

ARTO-1: Arroyo Toad Habitat Avoidance. Caltrans will require construction activities in Arroyo toad suitable habitat that is within 250 feet of intermittent or perennial waterways to occur only in compacted soils immediately adjacent to the roadway (e.g., shoulder). Conduit installation in such habitat will use methods that do not result in disturbance to suitable substrate (e.g., trenching in pavement, HDD, etc.).

CTS/WSF-1: Pre-Construction California Tiger Salamander and Western Spadefoot Vernal Pool Habitat Surveys. An approved biologist (BIO-7: Approved Biologist) will conduct a pre-construction survey along the project alignment plus a 250-foot radius if access is available prior to the date of initial ground disturbance and vegetation clearing. The approved biologist will assess all potential aquatic features identified during implementation of BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitat, and BIO-2: Covered Species-Specific Surveys. Potential vernal pools and seasonal wetlands will be assumed present unless appropriate surveys during the wet season (i.e., when ponding is most likely to be evident) or other evidence demonstrates the aquatic feature is not present. If potential vernal pools or seasonal wetlands/swales are present, an approved biologist will monitor avoidance of these areas. Caltrans will submit survey results to the Service with the annual programmatic report.

CTS/WSF-2: California Tiger Salamander and Western Spadefoot Vernal Pool Habitat Avoidance Buffer. To limit impacts to suitable vernal pools and seasonal wetland/swale habitat, an approved biologist (BIO-7: Approved Biologist) will delineate a 250-foot avoidance buffer as an ESA on plans and in the field and monitor these buffers, as necessary. Vegetation will be cleared by hand and monitored by an approved biologist when within the aquatic habitat avoidance buffer.

CTS/WSF-3: Seasonal California Tiger Salamander and Western Spadefoot Habitat Work Window and Avoidance. Depending on the type of suitable habitat identified during BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitat, Caltrans will apply the following seasonal work windows. Caltrans will implement Category 2 conservation measures described below if work occurs outside these work windows.

a. All construction activities in areas identified as suitable upland and aquatic habitat, excluding vernal pools, seasonal wetlands, or swales, for California tiger salamander or western spadefoot during BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitatwill be limited to May 1 to October 31.
b. All construction activities within 250 feet of identified suitable vernal pool and seasonal wetland/swale habitat for California tiger salamander or western spadefoot during the BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitat and/or CTS/WSF-1: Pre-Construction California Tiger Salamander and Western Spadefoot Vernal Pool Habitat Surveys will be limited to June 1 to October 15. Within this work window, work is only allowed if vernal pools remain dry for 72 hours consistent with AMPH-5: Rain Limitations.

CTS/WSF-4: Construction Methods to Limit Disturbance to California Tiger Salamander and Western Spadefoot Vernal Pool Habitat. When working within the 250-foot avoidance buffer of vernal pools and seasonal wetlands/swales, Caltrans will utilize the following construction methods to avoid or limit disturbance to vernal pool habitats as applicable:

a. Trenching in-pavement conduit installation method will be utilized to avoid removal of suitable soils.
b. HDD bores will be located outside of the 250-foot avoidance buffer such that at both the entry and exit locations the bore will reach a minimum depth of five feet prior to encroachment on the buffer.
c. No new MVPs will be created.
d. No new vaults will be installed.

YOTO-1: Yosemite Toad Lupine Area Avoidance. Caltrans will avoid open, dry lupine areas with rodent burrows. Open, dry lupine areas will not be used as vehicle turn-around locations, vehicle storage, or equipment staging unless first surveyed for Yosemite toad and rodent burrows. If walking through these sites, avoid walking where numerous rodent burrows and lupine are observed. Trips through these sites will be minimized and only one access route will be used.

Amphibian Category 2 Conservation Measures

The amphibian species that Category 2 conservation measures can be applied to include arroyo toad, California red-legged frog, California tiger salamander, Kern Canyon slender salamander, relictual slender salamander, and western spadefoot.

AMPH-6: Amphibian Species Relocation Plan. Caltrans will prepare a relocation plan for covered species with a project-level determination of LAA if surveys confirm that the covered species is present, or if surveys are not done but the project footprint is in suitable habitat. If a covered species is present, or presumed present, but individuals are not reasonably likely to occur within the project footprint, then Caltrans may forego preparing a relocation plan with the written approval of the Service. The covered species relocation plan will be reviewed and approved by the Service, and CDFW as applicable, as part of the Project Notification Report. The plan will include capture and relocation methods, relocation site, and post-relocation monitoring, if applicable. Only an approved biologist (BIO-7: Approved Biologist) will capture, handle, and relocate covered species. The plan will also identify engineering controls to prevent covered amphibians recolonization of the project footprint and provide a schedule of construction and translocation activities, as applicable. Measures to prevent the spread of disease and other contamination will be followed in accordance with the *Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger salamander* (Service 2003). Covered amphibians will be handled and assessed according to the *Restraint and Handling of Live Amphibians* (Fellers et al. 1994). The approved biologist will relocate and release the individual to habitat located outside of the work area. Caltrans will notify the Service within 24 hours of any covered amphibian relocations.

Amphibian Species-Specific Category 2 Measures

ARTO-2. Avoid Arroyo Toad Habitat Disturbance. If Caltrans cannot implement ARTO-1, a Service-approved AMPH-6: Amphibian Species Relocation Plan will be obtained before initial construction when conducting activities in Arroyo toad suitable habitat within 250 feet of intermittent or perennial waterways. Caltrans will utilize conduit installation methods that limit disturbance to existing grades and vegetation to the actual site of the project and necessary access routes. The placement of all staging areas and other facilities will avoid and limit disturbance to sensitive habitats (e.g., stream banks, stream channel, riparian habitat, sandy soils) as much as possible. Exclusion fencing, BIO-16: Wildlife Exclusion Fencing for Stationary Work Sites, approved by the Service, will be installed at HDD drilling sites, other stationary work sites, and any material stockpiles, to prevent arroyo toads from entering the work area. Best practices for survey, detection, and relocation for Arroyo toad will be submitted to and approved by the Service, AMPH 6: Amphibian Species Relocation Plan.

CTS/WSF-5. Avoid Vernal Pools/Swales and Seasonal Wetland During Wet Season. Caltrans will avoid all direct disturbance to vernal pools/swales and seasonal wetlands if work occurs within 250 feet of a vernal pools/swales or seasonal wetlands outside of the work window, CTS/WSF-3: Seasonal California Tiger Salamander and Western Spadefoot Habitat Work Window and Avoidance (B).

CTS/WSF-6: Construction Method Minimization within Avoidance Buffer. If Caltrans cannot restrict project activities to outside of the 250-foot vernal pool/swale and seasonal wetlands avoidance buffer as identified in CTS/WSF-4: Construction Methods to Limit Disturbance to California Tiger Salamander and Western Spadefoot Vernal Pool Habitats, then the following minimization measures for HDD and plowing/trenching will be applied:

a. HDD: Any basin within the 250-foot avoidance buffer used to collect drilling returns will be formed either with above ground reinforcement (e.g., sandbags/gravel bags with

Visqueen/plastic), or by shallow excavation. All shallow excavations will be monitored by the approved biologist (BIO-7: Approved Biologist) to determine when to stop excavation to avoid disturbance of the duripan. No deeper excavations that result in disturbance to the duripan for this purpose are allowed.

b. HDD: Where a connection of two segments of conduit (i.e., at the end of a bore) occurs within the 250-foot avoidance buffer, then the excavation will occur with assistance from an approved biologist. The approved biologist will monitor and identify the soil types during the excavation. The topsoil and retention layer will be stored separately. After the splice is completed, the retention layer will be returned at the depth encountered, a bentonite slurry will be added to the splice excavation, and the topsoil returned.

c. Plowing/Trenching: When working within the 250-foot avoidance buffer, soil layers will be isolated, retained and restored in the order they occur to preserve drainage patterns and microhydrology.

Fish Conservation Measures

Fish Category 1 Conservation Measures

FISH-1: Fish Aquatic Habitat Avoidance Buffer. Caltrans will avoid suitable habitat for covered fish determined during BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitat and will designate a 250-foot buffer around these areas as ESAs. An approved biologist (BIO-7: Approved Biologist) will delineate these ESAs in the field and will monitor these areas to ensure BIO-12: Protections for Species and their Habitat, BIO-13: Water Quality, Aquatic Features, and Vegetation Protection Measures, and BIO-14: Maintenance, Staging, and Storage of Equipment are implemented to limit disturbance to upland habitat adjacent to or over aquatic features.

FISH-2. Rain Limitations. All project activities will cease on days with rainfall equal to or greater than 0.5 inch during a 24-hour period, or a forecast predicting this level of rain, in areas adjacent to suitable habitat for covered fish. Construction activities halted due to precipitation may resume when precipitation ceases, and the National Weather Service 72-hour weather forecast indicates less than a 50 percent chance of 0.5 inch of rain or less during a 24-hour period.

Snail Conservation Measures

Snail Category 1 Conservation Measures

SNAIL-1: Pre-Construction Snail Surveys. An approved biologist (BIO-7: Approved Biologist) will conduct a pre-construction survey for Morro shoulderband snail within the project footprint no more than 7 days prior to the date of initial ground disturbance and vegetation clearing in suitable habitat, including non-native vegetation such as ice plant and veldt grass prevalent on roadsides, as determined during BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitat. From April through October, a single survey will involve moving and searching under all vegetation and other suitable cover (e.g., woodpiles, tires, debris). From November through March, at least two pre-construction surveys will be conducted along the project footprint. Caltrans will submit survey results to the Service with the annual programmatic report.

SNAIL-2: Biological Monitor and Daily Clearance Surveys. An approved biologist (BIO-7: Approved Biologist) will be onsite during all ground-disturbing and vegetation clearing activities within Morro shoulderband snail suitable habitat, including non-native vegetation such as ice plant and veldt grass prevalent on roadsides. The approved biologist will conduct daily clearance surveys of all equipment, vehicles, and stockpiled materials at the beginning of each day and regularly throughout the workday when construction activities are occurring. An approved biologist will always accompany all construction-related activities in suitable habitat for Morro shoulderband snail.

SNAIL-3: Hand Removal of Vegetation. Caltrans will cut vegetation using hand tools to 3 inches in height within suitable habitat for Morro shoulderband snail, including non-native vegetation such as ice plant and veldt grass prevalent on roadsides. Once the ground is visible, a visual survey for Morro shoulderband snail will be conducted by the approved biologist (BIO-7: Approved Biologist) prior to additional ground disturbance.

Insect Conservation Measures

Insect Category 1 Conservation Measures

INSECT-1: Seasonal Insect Work Window. All activities will be limited to the following work windows shown in Table 15 in areas identified as habitat for covered insect species determined during BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitat. Category 2 conservation measures described below will be implemented if work within seasonal windows cannot be implemented.

Table 15. Seasonal insect work windows.

Species	Seasonal Insect Work Window
Bay checkerspot butterfly	July 1 to March 14
Behren’s silverspot butterfly	October 1 to June 1
Callippe silverspot butterfly	August 1 to March 1
Carson wandering skipper	August 1 to April 31
Casey’s June beetle (CJB)	August 1 to March 14
Delhi sands flower-loving fly (DSFLF)	October 1 to June 30
El Segundo blue butterfly	September 1 to June 15
Hermes copper butterfly (HERMES)	August 1 to April 30
Kern primrose sphinx moth	May 1 to January 15

Species	Seasonal Insect Work Window
Mission blue butterfly	August 1 to March 1
Monarch butterfly (MON)	See MON-1
Mount Hermon June beetle (MHJB)	September 1 to April 30
Myrtle's silverspot butterfly	September 15 to June 15
Oregon silverspot butterfly	September 15 to June 30
Quino checkerspot butterfly	August 1 March 1
San Bruno elfin butterfly	July 30 to March 1
Smith's blue butterfly (SBB)	September 15 to June 1
Valley elderberry longhorn beetle (VELB)	August 1 to March 1

Insect Species-Specific Category 1 Conservation Measures

CJB-1: Soil Salvaging in Palm Canyon Wash for Casey's June Beetle. For construction activities and soil excavation that occur in Palm Canyon Wash (State Route (SR)-111 Highway Post Mile (Miles (PM) 48.3-48.5), Caltrans will salvage excavated soil and redistribute in the wash after construction activities are complete to protect Casey's June beetle.

CJB-2: Tree Avoidance in Palm Canyon Wash for Casey's June Beetle. For construction activities and soil excavation that occur in Palm Canyon Wash (SR-111 PM 48.3-48.5), Caltrans will avoid removal of larger native trees and shrubs over six feet in height, including desert willow (*Chilopsis linearis*) and smoke tree (*Psorothamnus spinosus*) to protect Casey's June beetle.

CJB-3: Re-burial of Vegetation in Palm Canyon Wash for Casey's June Beetle. For construction activities that occur in Palm Canyon Wash (SR-111 PM 48.3-48.5), Caltrans will salvage woody vegetation that cannot be avoided and rebury onsite to protect Casey's June beetle.

DSFLF-1: Delhi Fine Sand Soil Salvaging for Delhi Sands Flower-loving Fly. Caltrans will collect all disturbed Delhi fine sand soil and replace unconsolidated at the original location to protect Delhi sands flower-loving fly habitat.

HERMES-1: Hermes Copper Butterfly Habitat Avoidance on Interstate-8. Caltrans will conduct all work on the north side of roadway when working east of Japatul Valley Road on Interstate-8 to protect Hermes copper butterfly.

MHJB-1: Soil Salvaging When in Suitable Habitat for Mount Hermon June Beetle. Caltrans will place surplus soil only on previously disturbed ground to protect Mount Hermon June beetle.

MON-1: Work Window in Monarch Butterfly Overwintering Habitat. Caltrans will only work between March 15 and September 15 in areas adjacent to monarch butterfly overwintering sites along the Pacific Coast and San Francisco Bay to protect monarch butterfly.

MON-2: Avoid Removal of Suitable Monarch Butterfly Overwintering Habitat. Caltrans will avoid/limit removal, including tree removal and trimming, of suitable monarch overwintering habitat (e.g., *Eucalyptus* sp.) within 0.5 mile of known overwintering sites.

SBB-1: *Eriogonum* Species Exclusion Buffers on SR 1 and SR 68. Caltrans will designate individual or groups of *Eriogonum latifloium* or *E. parvifolium* on SR 1 and SR 68 within the known range of the species in Monterey County that are identified during BIO-9: Pre-construction Surveys and are within 165 feet of the project footprint as ESAs. An approved biologist (BIO-7: Approved Biologist) will establish at least a 20-foot buffer from the dripline of each individual or group of *Eriogonum* host plants.

SBB-2: Smith's Blue Butterfly Habitat Restoration. Caltrans will implement BIO-5: Site Restoration, to include hydroseeding or planting of locally-procured host plant seeds or host plants, or seeds from plants grown from locally procured seeds. "Locally-procured" means the host plant seeds or plants are from within the subspecies range. Restoration plans will include long-term management and maintenance to minimize infestation from invasive species.

VELB-1: Elderberry Shrub Avoidance Buffers. Caltrans will designate elderberry shrubs in habitat determined to be suitable for the valley elderberry longhorn beetle during BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitat that are found during BIO-9: Pre-construction Surveys within 165 feet of the project footprint as ESAs. An approved biologist (BIO-7: Approved Biologist) will establish at least a 20 feet buffer from the dripline of each shrub.

ZAY-1: Avoid Critical Habitat Disturbance for Zayante Band-winged Grasshopper. Caltrans will minimize soil disturbance and implement a 15 feet avoidance buffer from host plants if suitable Zayante soils or silver bush lupine are located during pre-construction surveys in designated Zayante band-winged grasshopper critical habitat.

Insect Category 2 Conservation Measures

The insect species that Category 2 conservation measures can be applied to include Bay checkerspot butterfly, Behren's silverspot butterfly, Callippe silverspot butterfly, Casey's June beetle, Delhi sands flower-loving fly, Mission blue butterfly, Monarch butterfly, Mount Herman June beetle, Myrtle's silverspot butterfly, Oregon silverspot butterfly, Quino checkerspot butterfly, San Bruno elfin butterfly, Smith's blue butterfly, and valley elderberry longhorn beetle.

INSECT-2: Pre-construction Larvae, Host/Nectar Plants, and Suitable Habitat Survey outside of Seasonal Work Window. No more than 7 days prior to the date of initial ground disturbance and vegetation clearing, an approved biologist (BIO-7: Approved Biologist) will conduct a pre-construction survey for covered species larvae, species-specific host and/or nectar plants (see Table 16), as well as suitable habitat along the project footprint plus a 250-foot radius if access is available. These surveys may be conducted with PLANT-1: Pre-Construction Plant Surveys (described in the Plant Conservation Measures section of this PBO).

Table 16. Host and nectar plants/suitable habitat for insects.

Species	Host and Nectar Plants/Suitable Habitat(s)
Bay checkerspot butterfly	California plantain (*Plantago erecta*) Denseflower owl's clover (*Orthocarpus densiflorus*) Exserted paintbrush (*Casilleja exserta*)
Behren's silverspot butterfly	Blue violet (*Viola adunca*)
Callippe silverspot butterfly	California golden violet (*Viola pedunculata*)
Delhi sands flower-loving fly	Unconsolidated Delhi soils
Mission blue butterfly	Silver bush lupine (*Lupinus albifrons*) Many-colored lupine (*L. variicolor*) Summer lupine (*L. formosus*) Purple variety of yellow bush lupine (*L. arboreus*)
Monarch butterfly	Milkweed (*Asclepias* sp.)
Myrtle's silverspot butterfly	Blue violet (*Viola adunca*)
Oregon silverspot butterfly	Blue violet (*Viola adunca*) Nectar plants in Aster family
Quino checkerspot butterfly	California plantain (*Plantago erecta*) Patagonian plantain (*P. patagonica*) White snapdragon (*Antirrhinum coulterianum*) Chinese houses (*Collinsia concolor*)
San Bruno elfin butterfly	Plant stonecrop (*Sedum spathulifolium*)
Smith's blue butterfly	Host plants in Eriogonum family
Valley elderberry longhorn beetle	Elderberries (*Sambucus* sp.)

INSECT-3: Host/Nectar Plants and Suitable Habitat Avoidance Buffer. Caltrans will implement an avoidance buffer distance of 10 to 100 feet from host/nectar plants and suitable habitat for covered insects identified during BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitat. These areas will be delineated as ESAs on plans and in the field. An approved biologist (BIO-7: Approved Biologist) will delineate these areas in the field. Elderberry shrubs that cannot be avoided and must be trimmed or transplanted will adhere to

VELB-2: Trimming Elderberry Shrub Branches or Stems and VELB-3: Elderberry Transplanting.

INSECT-4: Biological Monitor and Daily Surveys. An approved biologist (BIO-7: Approved Biologist) will be onsite daily during all ground-disturbing activities occurring in or within 150 feet of the larval host plant, adult nectar plants, and suitable habitat for covered insects.

INSECT-5: Insect Species Relocation and/or Host Plant Salvage Plan. Caltrans will prepare a relocation plan and/or host plant salvage plan for covered species with a project-level determination of LAA if surveys confirm that the covered species is present, or if surveys are not done but the project footprint is in suitable habitat. If a covered species is present, or presumed present, but individuals are not reasonably likely to occur within the project footprint, then Caltrans may forego preparing a relocation or salvage plan with the written approval of the Service. The relocation or salvage plan will be reviewed and approved by the Service, and CDFW as applicable, as part of the Project Notification Report.

a. The species relocation plan will include capture and relocation methods, relocation site, and post-relocation monitoring, if applicable. Only an approved biologist (BIO-7: Approved Biologist) will capture, handle, relocate, or salvage covered species. The plan will also identify engineering controls to prevent covered insect recolonization of the project footprint and provide a schedule of construction and translocation activities, as applicable. Covered insects will also be handled and assessed according to established protocols or species-specific guidance from the Service. The approved biologist will relocate and release the individual to habitat located outside of the work area. Captured covered insects will be relocated into similar habitats (e.g., species captured from host or nectar plants will be relocated to suitable habitat containing the same host or nectar plants). The Service will be notified within 24 hours of any covered species relocations. All captured covered insects would be relocated within the same day.
b. If a covered insect host plant is present and it cannot be avoided, then plant material (e.g., seeds, cuttings, whole plants) will be salvaged by an approved biologist (BIO-7: Approved Biologist). The plan will include collection methods, relocation site, and post-relocation monitoring, if applicable. Covered insects collected and relocated will only be conducted by the approved biologist. In the area where salvage occurs, Caltrans will implement BIO-5: Site Restoration.

Insect Species-Specific Category 2 Conservation Measures

MHJB-2: Cover Soil Nightly for Mount Hermon June Beetle. If project activities will occur in suitable habitat for Mount Hermon June beetle between April 30 to September 1, Caltrans will place impervious materials such as plywood or plastic sheeting over exposed soil by 7:00 pm each night to prevent dispersing males from burrowing and being impacted by subsequent soil disturbance.

VELB-2: Trimming Elderberry Shrub Branches or Stems. If Caltrans determines elderberry shrub branches or stems less than 1 inch need to be removed during BIO-1: Assessment for Covered Species Habitats and Covered Critical Habitat, this will occur between October 31 and February 28 or 29. Stems greater than1 inch will be avoided to the greatest extent practicable.

VELB-3: Elderberry Transplanting. Caltrans will transplant elderberry shrubs determined to be habitat for the valley elderberry longhorn beetle that cannot be avoided or if indirect effects will result in the death of stems or the entire shrub. Any elderberry shrub that is unlikely to survive transplanting because of poor condition or location, or a shrub that will be extremely difficult to move because of access problems, may not be appropriate for transplanting. Elderberry shrubs will be transplanted in accordance with the *Framework for Assessing Impacts to the Valley Elderberry Longhorn* (Service 2017b):

a) Elderberry shrubs will be transplanted to an appropriate Service-approved location.
b) An approved biologist (BIO-7: Approved Biologist) will be onsite for the duration of transplanting activities.
c) Exit-hole surveys will be completed immediately before transplanting. The number of exit holes found, location of the plant to be relocated, and the location of where the plant is transplanted will be reported to the Service and to the CNDDB.
d) Elderberry shrubs will be transplanted when the shrubs are dormant (November 1 through the first two weeks in February) and after they have lost their leaves.
e) Transplanting will follow the most current version of the American National Standards Institute (ANSI) A300 (Part 6) guidelines for transplanting available at: TCIA | ANSI A300 Part 6.

Crustacean Conservation Measures

Crustacean Category 1 Conservation Measures

CRUS-1: Pre-Construction Crustacean Habitat Surveys. Prior to the date of initial ground disturbance and vegetation clearing, an approved biologist (BIO-7: Approved Biologist) will conduct a pre-construction survey along the project alignment plus a 250-foot radius if access is available. All potential aquatic features identified during implementation of BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitat, and BIO-2: Covered Species-Specific Surveys, will be assessed. Potential vernal pools and seasonal wetlands will be assumed present unless appropriate surveys during the wet season (i.e., when ponding is most likely to be evident) or other evidence demonstrates the aquatic feature is not present. If potential vernal pools or seasonal wetlands/swales are present, an approved biologist will monitor avoidance of these areas. Caltrans will submit survey results to the Service with the annual programmatic report.

CRUS-2: Crustacean Aquatic Habitat Avoidance Buffer. To limit impacts to suitable vernal pools and seasonal wetland/swale habitat, a 250-foot avoidance buffer will be delineated as an ESA on plans and in the field. An approved biologist (BIO-7: Approved Biologist) will delineate and monitor these buffers, as necessary. Caltrans will clear vegetation by hand when within the aquatic habitat avoidance buffer.

CRUS-3: Seasonal Crustacean Work Windows and Avoidance. All construction activities will be limited to June 1 to October 15 in areas within 250 feet of habitat identified as suitable for covered crustaceans during the BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitat. Within this work window, work is only allowed if vernal pools remain dry for 72 hours consistent with measure CRUS-5: Rain Limitations. Caltrans will implement Category 2 conservation measures if these seasonal work windows cannot be implemented.

CRUS-4: Construction Methods to Limit Disturbance to Vernal Pool Habitats. When working within the 250-foot avoidance buffer of vernal pools and seasonal wetlands/swales, Caltrans will utilize the following construction methods to avoid or limit disturbance to vernal pool habitats as applicable:

a. Trenching in-pavement conduit installation method will be utilized to avoid removal of suitable soils.
b. HDD bores will be located outside of the 250 feet avoidance buffer such that at both the entry and exit locations the bore will reach a minimum depth of five feet prior to encroachment on the buffer.
c. No new MVPs will be created.
d. No new vaults will be installed.

CRUS-5: Rain Limitations. Within suitable habitat for covered crustacean species, all project activities will cease on days with rainfall equal to or greater than 0.5 inch during a 24-hour period, or a forecast predicting this level of rain. Construction activities halted due to precipitation may resume when precipitation ceases, and the National Weather Service 72-hour weather forecast indicates less than a 50 percent chance of 0.5 inch of rain or less during a 24-hour period.

Crustacean Category 2 Conservation Measures

CRUS-6: Avoid Vernal Pools/Swales and Seasonal Wetlands During Wet Season. Caltrans will avoid all direct disturbance to vernal pools/swales and seasonal wetlands if work occurs within 250 feet of vernal pools/swales or seasonal wetlands outside of the work window identified in CRUS-3: Seasonal Crustacean Work Windows and Avoidance.

CRUS-7: Construction Method Minimization Within Avoidance Buffer. If it is not possible to conduct activities outside of the 250-foot vernal pool/swale and seasonal wetlands avoidance buffer as identified in CRUS-4: Construction Methods to Limit Disturbance to Vernal Pool Habitats, then the following minimization measures for HDD and plowing/trenching will be applied:

a. HDD: Any basin within the 250-foot avoidance buffer used to collect drilling returns will be formed either with above ground reinforcement (e.g., sandbags/gravel bags with Visqueen/plastic), or by shallow excavation. All shallow excavations will be monitored by the approved biologist (BIO-7: Approved Biologist) to determine when to stop excavation to avoid disturbance of the duripan. No deeper excavations that result in disturbance to the duripan for this purpose are allowed.
b. HDD: Where a connection of two segments of conduit (i.e., at the end of a bore) occurs within the 250-foot avoidance buffer, then the excavation will occur with assistance from an approved biologist. The approved biologist (BIO-7: Approved Biologist) will monitor and identify the soil types during the excavation. The topsoil and retention layer will be stored separately from other soils. After the splice is completed, the retention layer will be returned at the depth encountered, a bentonite slurry will be added to the splice excavation, and the topsoil returned.
c. Plowing/Trenching: When within the 250-foot avoidance buffer, soil layers will be isolated, retained and restored in the order they occur to preserve drainage patterns, microhydrology, and crustacean cysts.

Plant Conservation Measures

Plant Category 1 Conservation Measures

PLANT-1. Pre-Construction Plant Surveys during Blooming Period. An approved biologist (BIO-7: Approved Biologist) will conduct surveys for covered plant species in areas identified as habitat for covered plants during the BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitat. Surveys will be conducted during the appropriate blooming period(s) and within suitable soils for all covered plants with potential to occur in the action area (Table 17). Caltrans will submit survey results to the Service with the annual programmatic report.

Table 17. Covered plant species blooming periods and soil requirements (as applicable).

Species	Blooming Period	Soils
Ash-grey paintbrush (PEBBLE)	June to August	Pebble plain
Baker's larkspur	March to May	Not applicable
Bakersfield cactus	April to May	Sandy/gravelly (sometimes)
Beach layia	March to July	Not applicable
Ben Lomond (Santa Cruz) wallflower	March to July	Sandy
Ben Lomond spineflower	April to June	Sandy
Bear Valley sandwort	May to August	Pebble plain
Braunton's milk-vetch	January to August	Carbonate

Species	Blooming Period	Soils
Butte County meadowfoam	March to May	Vernal pool
California jewelflower	February to May	Sandy
California Orcutt grass	May to June	Vernal pool
California taraxacum (PEBBLE)	May to August	Pebble plain
Chinese camp brodiaea	May to June	Serpentine
Chorro Creek bog thistle	February to July (sometimes extending into September)	Serpentine
Clara Hunt's milk-vetch	March to May	Serpentine
Coachella Valley milk-vetch	January to April	Sandy
Coastal dunes milk-vetch	March to May	Not applicable
Colusa grass	May to August	Vernal pool
Contra Costa goldfields	March to June	Vernal pool
Cushenbury buckwheat	May to August	Carbonate
Cushenbury milk-vetch	March to October	Carbonate
Cushenbury oxytheca	May to October	Carbonate
Del Mar Manzanita	June to April	Not applicable
El Dorado bedstraw	May to June	Gabbroic
Encinitas baccharis	August to November	Not applicable
Few-flowered navarretia	May to June	Vernal pool
Fish-slough Milk-vetch	June to July	Alkaline
Fleshy owl's clover	April to May	Vernal pool
Fountain thistle	April to October	Serpentine
Franciscan manzanita	February to April	Serpentine
Gambel's watercress	April to October	Not applicable
Gentner's fritillary (GF)	April to June	Not applicable
Greene's tuctoria	May to July	Vernal pool
Hairy Orcutt grass	May to September	Vernal pool
Hartweg's golden sunburst	March to April	Clay
Hickman's potentilla (cinquefoil)	March to June (survey between April and May)	Not applicable
Hoover's spurge	July to September	Vernal pool
Howell's spineflower	May to July	Not applicable
Ione (incl. Irish Hill) buckwheat	June to October	Ione

Species	Blooming Period	Soils
Ione manzanita	November to march	Ione
Keck’s checker-mallow	April to May	Serpentine or clay
Kern mallow (KERN)	January to May	Sandy or clay
La Graciosa thistle	May to August	Not applicable
Laguna Beach liveforever	May to July	Not applicable
Lake County stonecrop	April to May	Vernal pool
Large-flowered fiddleneck	April to May	Sandy
Layne’s butterweed	April to August	Serpentine
Loch Lomond coyote thistle	April to June	Vernal pool
Many flowered navarretia	May to June	Vernal pool
Marin dwarf-flax	April to June	Serpentine
Marsh sandwort (MARSH)	May to August	Sandy
Menzie’s wallflower	March to September	Not applicable
Metcalf Canyon jewel-flower	April to July	Serpentine
Monterey clover	April to June	Not applicable
Monterey gilia	April to June	Sandy
Monterey spineflower	April to August	Sandy
Munz’s onion	March to May	Clay
Nevin’s barberry	February to June	Sandy
Nipomo Mesa lupine	March to May	Not applicable
Orcutt’s spineflower	March to May	Sandy
Otay tarplant	April to June	Clay
Palmate-bracted bird’s beak	May to October	Alkaline
Parish’s daisy	Mat to August	Carbonate
Pedate checker-mallow (bird foot checkerbloom) (PEBBLE)	May to August	Pebble plain
Peirson’s milk-vetch	December to April	Sandy
Pine Hill ceanothus	April to June	Serpentine or gabbroic
Pine Hill flannelbush	April to July	Serpentine or gabbroic
Pismo clarkia (PISMO)	May to July	Sandy
Red Hills Vervain	May to September	Serpentine
Robust spineflower	May to July	Not applicable

Species	Blooming Period	Soils
Sacramento Orcutt grass	April to September	Vernal pool
Salt marsh bird’s beak	May to October	Not applicable
San Bernardino bluegrass (PEBBLE)	May to July	Pebble plain
San Diego ambrosia	April to October	Clay
San Diego button-celery	April to June	Vernal pool
San Diego mesa-mint	March to July	Vernal pool
San Diego thornmint	April to June	Clay
San Francisco lessingia	June to November	Not applicable
San Jacinto Valley crownscale	May to June	Vernal pool
San Joaquin adobe sunburst	February to April	Adobe clay
San Joaquin Orcutt grass	April to September	Vernal pool
San Joaquin wooly-threads	February to May	Sandy
Santa Ana River woollystar	April to September	Not applicable
Santa Clara Valley dudleya	April to October	Serpentine
Santa Cruz cypress	Not applicable	Not applicable
Santa Cruz tarplant	June to August	Not applicable
Santa Monica Mountains dudleya (SMMD)	March to June	Rocky or volcanic
Showy Indian clover	April to June	Not applicable
Slender Orcutt grass	May to October	Vernal pool
Slender-horned spineflower	April to June	Sandy
Slender-petaled mustard (thelypodium) (PEBBLE)	May to September	Alkaline or pebble plain
Southern mountain buckwheat	June to September	Pebble plain
Spreading navarretia	April to June	Vernal pool
Springville clarkia	March to July	Granitic
Stebbins’ morning-glory	April to July	Serpentine
Thread-leaved brodiaea	March to June	Vernal pool
Tiburon paintbrush	April to June	Serpentine
Triple-ribbed milk-vetch	February to May	Not applicable
Vandenberg monkeyflower	April to June	Sandy
Ventura Marsh milk-vetch	August to October	Sandy
Verity’s dudleya	May to June	Volcanic

Species	Blooming Period	Soils
Vine Hill clarkia	June to August	Acidic loam
Webber’s ivesia	May to June	Not applicable
White sedge	May to July	Not applicable
Willowy monardella	June to August	Not applicable
Yadon’s piperia	May to July	Not applicable
Yellow larkspur	March to May	Rocky
Yreka phlox (PHLOX)	April to June	Serpentine

PLANT-2: Avoidance Buffer of Covered Plants and their Habitats. If surveys confirm the presence of covered plants, or if a survey is not conducted and presence of covered plants is assumed based on suitable habitat, then an approved biologist (BIO-7: Approved Biologist) will establish a minimum 50-feet avoidance buffer around all covered plant occurrences or their suitable habitat (when presence is assumed). The avoidance buffer will be clearly established by an approved biologist. A larger avoidance buffer may be established if determined by the approved biologist to be necessary for the protection of the plant populations, individuals, or suitable habitat. Activities that have the potential to reduce habitat quality, including soil disturbance, will be avoided. For annual forbs, work may occur after plants have set seed and senesced and associated habitat will not be permanently impacted. For perennial species, disturbance to underground portions of the plant such as roots, bulbs and tubers will be avoided. The approved biologist will advise Caltrans of any additional, appropriate methods to limit disturbance of covered plants within these buffers. Caltrans will implement Category 2 conservation measures if work within these buffers cannot be limited to insignificant or discountable effects, or the buffers cannot be implemented.

PLANT-3: Minimize Disturbance Near Covered Plants and/or Suitable Habitat. Any vegetation clearing or ground disturbance within the avoidance buffer, PLANT-2: Avoidance Buffer of Covered Plants and their Habitats, of covered plants and/or their suitable habitat will be minimal and only conducted under the observation of an approved biologist (BIO-7: Approved Biologist). Direct disturbance to individual plants or seedbanks, and/or permanent alterations or degradation of habitat will not occur. The upper 4 inches of topsoil during excavations will be stockpiled separately and used to restore the disturbed areas. Actions will be taken to ensure seedbank protection and topsoil remains viable for plant propagation (i.e., return to area in same season as removed, height of stockpiles kept as low as possible, protect stockpiles from wind erosion or other damage, soil not treated with pesticides, and/or any cover, if added, would not result in soil sterilization).

Plant Species-specific Category 1 Measures

VP-1: Pre-Construction Vernal Pool Plant Habitat Surveys. Prior to the date of initial ground disturbance and vegetation clearing, an approved biologist (BIO-7: Approved Biologist) will conduct a pre-construction survey along the project alignment plus a 250 feet radius if access is available. All potential aquatic features identified during implementation of BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitat, and BIO-2: Covered Species-Specific Surveys, will be assessed. Potential vernal pools and seasonal wetlands will be assumed present unless appropriate surveys during the wet season (i.e., when ponding is most likely to be evident) or other evidence demonstrates the aquatic feature is not present. If potential vernal pools or seasonal wetlands/swales are present, an approved biologist will monitor avoidance of these areas. Caltrans will submit survey results to the Service with the annual programmatic report.

VP-2: Vernal Pool Plant Aquatic Habitat Avoidance Buffer. To limit impacts to suitable vernal pools and seasonal wetland/swale habitat, a 250 feet avoidance buffer will be delineated as an ESA on plans and in the field. An approved biologist (BIO-7: Approved Biologist) will delineate and monitor these buffers, as necessary. Caltrans will adhere to the 50 feet buffer around covered plant occurrences in PLANT-2: Avoidance Buffer of Covered Plants and their Habitats. Vegetation will be cleared by hand and monitored by an approved biologist when within the aquatic habitat avoidance buffer.

VP-3: Seasonal Vernal Pool Plant Species Work Windows. Caltrans will limit all construction activities to July 1 to October 15 in areas within 250 feet of habitat identified as suitable for vernal pool plant species during the BIO-1: Assessment for Covered Species Habitats and Designated Critical Habitat. Within this work window, work is only allowed if vernal pools remain dry for 72 hours consistent with measure VP-5: Rain Limitations.

VP-4: Construction Methods to Limit Disturbance to Vernal Pool Habitats. Caltrans will utilize the following construction methods when working within the 250 feet avoidance buffer of vernal pools and seasonal wetlands/swales to avoid or limit disturbance to vernal pool habitats as applicable:

a. Trenching in-pavement conduit installation method will be utilized to avoid removal of suitable soils.
b. HDD bores will be located outside of the 250 feet avoidance buffer such that, at both the entry and exit locations, the bore will reach a minimum depth of 5 feet prior to encroachment on the buffer.
c. No new maintenance vehicle pullouts will be created.
d. No new vaults will be installed.

VP-5: Rain Limitations. Within suitable habitat for covered vernal pool plants, all project activities will cease on days with rainfall equal to or greater than 0.5 inch during a 24-hour period, or a forecast predicting this level of rain. Construction activities halted due to precipitation may resume when precipitation ceases, and the National Weather Service 72-hour weather forecast indicates less than a 50 percent chance of 0.5 inch of rain or less during a 24-hour period.

GWC-1: Avoid Gambel's Watercress on SR 1 near Bixby Slough Area. To protect Gambel's watercress when working on SR 1 near Bixby Slough area, all work will occur within the pavement or east of SR 1 and installation methods will ensure no changes to the hydrology of Bixby Slough.

GF-1: Seasonal Work Window for Gentner's Fritillary. If occurrences of Gentner's fritillary are detected during PLANT-1: Pre-Construction Plant Surveys during Blooming Period, work will occur October 1 through December 31 and an avoidance buffer will be implemented, GF-2: Avoidance Buffer for Gentner's Fritillary Occurrences. Caltrans will implement Category 2 conservation measures described below if work cannot be limited to this seasonal work window.

GF-2: Avoidance Buffer for Gentner's Fritillary Occurrences. If surveys confirm the presence of Gentner's Fritillary, or if a survey is not conducted and presence of covered plant species is assumed based on suitable habitat, then an approved biologist (BIO-7: Approved Biologist) will establish a minimum 50 feet avoidance buffer around all occurrences or their suitable habitat (when presence is assumed). The avoidance buffer will be clearly established by an approved biologist who will monitor construction activities. Physical site conditions at and within occurrences will be maintained during and after construction. No new access roads or staging areas will be constructed or established.

KERN-1: Avoid Kern Mallow on SR 33 and SR 119. To protect Kern mallow when working on SR 33 and SR 119 near recent occurrences, work will occur within the pavement or on the opposite side of the roadway from occurrences.

PEBBLE-1: Avoid Impacts to Pebble Plain Plant Species on SR 18. To protect plant species occurring in pebble plain soil types when working on SR 18 at PM 46.8-47.2 and PM 57.5-58.1, all work will occur within the pavement or on the opposite side of the roadway from occurrences of all pebble plain species.

PISMO-1: Avoid Pismo Clarkia on SR 101. To protect Pismo clarkia when working on SR 101 near the town of Pismo Beach and Arroyo Grande, work will occur on the west side of SR 101 near the intersection of Mattie Road, and on the east side of SR 101 between Summit Station Road and Sandyvale Drive.

MARSH-1: Avoid Marsh Sandwort on SR 1. To protect marsh sandwort when working on SR 1 near the intersection of Callendar Road (PM 7.0-7.3), all work will occur within the pavement or with HDD to ensure no impacts to adjacent waterways.

SMMD-1: Avoid Santa Monica Mountains Dudleya on SR 27. To protect Santa Monica Mountains dudleya on SR 27, all work will occur on the east side of the roadway when working within known CNDDB occurrences.

VMF-1: Avoid Vandenberg Monkeyflower on SR 1 near Vandenberg Air Force Base. To protect Vandenberg monkeyflower when working on SR 1 near Vandenberg Air Force Base, all work will occur within the pavement or east of SR 1.

PHLOX-1: Avoid Yreka Phlox on SR 3 in Siskiyou County. The SR 3 population of Yreka phlox is currently delineated by Caltrans as an ESA and delineated for other Caltrans maintenance and operations work. To protect Yreka phlox when working in this area, Caltrans will utilize the following measures:

a. Trench in pavement installation method will be used to install conduit at locations within and near the Yreka phlox ESA. Trenching should occur as close to the centerline as possible to minimize soil disturbance and reduce exposure of Yreka phlox to dust. Construction equipment and personnel will be confined to the paved roadway and will not access vegetated areas off the roadway.
b. Caltrans will develop a dust abatement plan to reduce dust to the greatest extent possible during asphalt-trenching and all other activities that may generate dust.
c. Caltrans will not establish access roads, staging areas, or permanent infrastructure near locations with Yreka phlox or close enough to the phlox to potentially impact site conditions. A buffer will be established (PLANT-2: Avoidance Buffer of Covered Plants and their Habitats) where no access roads or staging areas will be built.
d. An approved biologist (BIO-7: Approved Biologist) will be on site during construction to assist with plant avoidance, and to ensure compliance with the dust abatement plan.

Plant Category 2 Conservation Measures

The plant species that Category 2 conservation measures can be applied to include all covered plant species with a LAA determination as identified in Table 1.

PLANT-4: Salvaging Plant Materials and Relocation Plan. If a covered plant is present and it cannot be avoided, then an approved biologist (BIO-7: Approved Biologist) will salvage plant material (e.g., seeds, cuttings, whole plants). Caltrans will develop a salvage and relocation plan for covered species with a project-level determination of LAA if surveys confirm that the covered species is present, or if surveys are not done but the project footprint is in suitable habitat. If a covered species is present, or presumed present, but individuals are not reasonably likely to occur within the project footprint, then Caltrans may forego preparing a relocation plan with the written approval of the Service. The plan will include collection methods, relocation site, and post-relocation monitoring, if applicable. Only an approved biologist will collect and relocate covered plants. In the area where salvage occurs, Caltrans will implement BIO-5: Site Restoration.

PLANT-5: Limit Impacts to Annual Plant Species. If a covered annual plant is present and PLANT-3: Minimize Disturbance near Covered Plants and/or Suitable Habitat cannot be implemented, then project activities will be conducted after the approved biologist (BIO-7:

Approved Biologist) determines that seeds have matured, to the extent practicable and Caltrans will implement PLANT-4: Salvaging Plant Materials and Relocation Plan.

PLANT-6: Limit Impacts to Perennial Plant Species. If a covered perennial plant is present and PLANT-3: Minimize Disturbance near Covered Plants and/or Suitable Habitat, then covered activities will be conducted after the approved biologist (BIO-7: Approved Biologist) determines that seeds have fully dispersed. If perennial plant seeds are not dispersed, then Caltrans will implement PLANT-4: Salvaging Plant Materials and Relocation Plan. Disturbance to the below ground portions of the plants (e.g., roots, bulbs, tubers) will be minimized.

PLANT-7: Limit Impacts to Shrubs. If Caltrans cannot implement PLANT-3: Minimize Disturbance near Covered Plants and/or Suitable Habitat and trimming of covered shrubs is required, it will be done in a manner that promotes re-sprouting and will occur at an appropriate time of year (i.e., before flowering or after fruiting) when an approved biologist (BIO-7: Approved Biologist) is present. If permanent impacts are unavoidable (i.e., removal or destruction of shrubs), new individuals will be established by planting seedlings or cuttings in adjacent suitable habitat following A Service- and CDFW-approved restoration plan, PLANT-4: Salvaging Plant Materials and Relocation Plan.

Plant Species-Specific Category 2 Measures

VP-6: Avoid Vernal Pools/Swales and Seasonal Wetlands during Wet Season. Caltrans will avoid all direct disturbance to vernal pools/swales and seasonal wetlands if work occurs within 250 feet of a vernal pool/swale or seasonal wetland outside of the work window identified in VP-3: Seasonal Vernal Pool Plant Species Work Windows.

VP-7: Construction Method Minimization Within Avoidance Buffer. If it is not possible to conduct activities outside of the 250-foot vernal pool/swale and seasonal wetlands avoidance buffer as identified in VP-4: Construction Methods to Limit Disturbance to Vernal Pool Habitats, then the following minimization measures for HDD and plowing/trenching will be applied:

a. HDD: Any basin within the 250-foot avoidance buffer used to collect drilling returns will be formed either with above ground reinforcement (e.g., sandbags/gravel bags with Visqueen/plastic), or by shallow excavation. All shallow excavations will be monitored by the approved biologist (BIO-7: Approved Biologist) to determine when to stop excavation to avoid disturbance of the duripan. No deeper excavations that result in disturbance to the duripan for this purpose are allowed.
b. HDD: Where a connection of two segments of conduit (i.e., at the end of a bore) occurs within the 250-foot avoidance buffer, then the excavation will occur with assistance from an approved biologist. The approved biologist will monitor and identify the soil types during the excavation. The topsoil and retention layer will be stored separately. After the splice is completed, the retention layer will be returned at the depth encountered, a bentonite slurry will be added to the splice excavation, and the topsoil returned.

c. Plowing/Trenching: When within the 250-foot avoidance buffer, soil layers will be isolated, retained, and restored in the order they occur to preserve drainage patterns and preserve plant seeds.

GF-3: Work Restrictions Outside of Seasonal Work Window for Gentner's Fritillary. If work occurs January 1 to September 30, Caltrans will apply the following restrictions when working within suitable habitat for Gentner's fritillary:

a. HDD installation methods will be used within unoccupied suitable habitat if it occurs within 50 feet of a Gentner's fritillary occurrence.
    i. HDD borings will have a minimum depth of 10 feet in all areas within 20 feet of a Gentner's fritillary occurrence or in areas previously known to contain occurrences.
    ii. HDD pits will be located at least 50 feet from Gentner's fritillary occurrences. If a known CNDDB occurrence polygon is longer than the maximum distance HDD can cover (approximately 1000 feet) then the 50-foot avoidance buffer for pits may be reduced with authorization from the Service.
b. Conduit installation using any method may be used within unoccupied suitable habitat if it occurs at least 50 feet from known Gentner's fritillary occurrences.
c. Vegetation removal or alteration in unoccupied suitable habitat within 50 feet of Gentner's fritillary occurrences will be minimized.
d. Network hubs will be no closer than 200 feet from Gentner's fritillary occurrences and pull and splice vaults will be placed at least 50 feet from occurrences.
e. Equipment and personnel must be confined to the asphalt roadway when work takes place adjacent to Gentner's fritillary occurrences.

<u>Implementation in Coordination with California Endangered Species Act</u>

The following conservation measures will be incorporated into individual MMBN projects that may affect dually-listed species (species listed by the Service and by the State of California). These measures are included in this PBO with the goal of facilitating state and federal coordination and to provide efficiencies for individual MMBN projects that may affect species listed under both the Act and CESA.

Species jointly listed under the Act and CESA are noted in Table 1 of this PBO with an asterisk (*). The following species are also classified as Fully Protected under Fish and Game Code Sections 3511, 4733, 5050, and 5515 and will not be captured, handled or relocated and Caltrans will not seek any CESA incidental take authorization due to their current status as Fully Protected: peninsular bighorn sheep, salt marsh harvest mouse, California clapper rail, California condor, California least tern, light-footed Ridgway's rail, Yuma Ridgway's rail, blunt-nosed leopard lizard, San Francisco garter snake, Santa Cruz long-toed salamander, and razorback sucker (humpback sucker).

CESA-1: Compensation for Impacts. Where applicable for CESA-listed covered species, permanent and temporary loss of species-specific suitable habitats will be mitigated through compensatory actions. Caltrans will first use approved conservation bank or mitigation bank credits for compensation, if available, and then pursue other habitat restoration or acquisition. Caltrans will coordinate with the Service and CDFW regarding a proposed strategy if compensatory mitigation is identified as required.

CESA-2: Mark Vegetation for Removal. Prior to clearing and grubbing operations where applicable for CESA-listed covered species habitat, an approved biologist (BIO-7: Approved Biologist) will clearly mark vegetation within the project area that shall be removed, and all other vegetation shall be avoided. Vegetation outside the project area will not be removed.

CESA-3: Covered Species Relocation Plan. For applicable CESA-listed covered species, an approved biologist (BIO-7: Approved Biologist) will prepare a Covered Species Relocation Plan (Relocation Plan) for approval by CDFW and the Service. The Relocation Plan will include, but not be limited to, pre-activity survey methodology appropriate for the season, hand excavation, capture, handling, relocation methods, and identification of where the individuals will be relocated to. The relocation areas will be identified by the approved biologist based upon the most suitable habitat available and time of year and approved by CDFW and the Service prior to the start of project activities. The Relocation Plan will be submitted to CDFW and the Service for review and approval before the project activities begin. Project activities will not proceed until the Relocation Plan is approved in writing by CDFW and the Service. Only the approved biologist will be authorized to capture and handle the covered species.

CESA-4: Covered Species Relocation. For applicable CESA-listed covered species, an approved biologist (BIO-7: Approved Biologist) will relocate any individuals likely to be impacted to suitable habitat no more than 300 feet outside of the project area and in accordance with the Relocation Plan described in CESA-3: Covered Species Relocation Plan, unless otherwise approved by CDFW and the Service in writing. The approved biologist will document both the capture and relocation areas with photographs and GPS positions. The covered species will be photographed and measured for identification purposes prior to relocation. A description of the habitat and health assessment of the species (i.e., presence of any potential diseases, injuries, and malformations) will be included in the documentation provided to CDFW and the Service within 24 hours of covered species relocation.

CESA-5: Covered Species Handling and Injury. If an injured CESA-listed covered species is found, an approved biologist (BIO-7: Approved Biologist) will evaluate the individual and immediately contact the CDFW Regional Representative and the Service, via email and telephone, to discuss next steps. If the CDFW Regional Representative and the Service cannot be contacted immediately, the approved biologist will place the injured individual in a safe and shaded location. Any injured covered species will be handled and assessed according to relevant guidance. If the CDFW Regional Representative or the Service is not available or has not responded within 15 minutes of initial attempts, then the following steps will be taken:

a. If the injury to the covered species is minor or healing and the individual is likely to survive, the individual will be released immediately.
b. If it is determined that the covered species has major or serious injuries as result of project activities, then the approved biologist will immediately take it to a CDFW- and Service-approved facility. If taken into captivity the individual will remain in captivity and will not be released into the wild unless it has been kept in quarantine and the release is authorized by CDFW and the Service. The permittee will bear any costs associated with the care or treatment of such injured covered species. A written report detailing injury or take of a covered species will be submitted to CDFW and the Service within two calendar days of discovery. The circumstances of the injury, the procedure followed, and the final disposition of the injured animal will also be documented in a written incident report as described in Monthly Compliance Report.

If a deceased covered wildlife species is found, the CDFW Regional Representative and the Service will be contacted immediately.

CESA-6: Notification Before Commencement. For appropriate CESA-listed covered species, an approved biologist (BIO-7: Approved Biologist) will notify CDFW and the Service at least 14 calendar days before starting covered activities and will document compliance with all project-specific conservation measures before starting project activities.

CESA-7: Notification of Non-compliance. For appropriate CESA-listed covered species, an approved biologist (BIO-7: Approved Biologist) will immediately notify CDFW and the Service in writing if it determines that Caltrans is not in compliance with project-specific notification plans or conservation measures, including but not limited to any actual or anticipated failure to implement measures within the indicated time periods. The approved biologist will report any non-compliance to CDFW and the Service within 24 hours.

CESA-8: Monthly Compliance Report. For appropriate CESA-listed covered species, an approved biologist (BIO-7: Approved Biologist) will compile the observation and inspection records into a Monthly Compliance Report and submit it to CDFW and the Service along with notes showing the current implementation status of each mitigation measure. Monthly Compliance Reports will detail approximate project activity impacts in acres, separated into permanent and temporary impacts. The reports will: (1) identify and describe the temporary and permanent impacts to date; (2) describe the location, acres, and type of restoration actions that have occurred; and (3) include all required monitoring information. CDFW or the Service may at any time increase the timing and number of compliance inspections and reports required under this provision depending upon the results of previous compliance inspections. If CDFW or the Service determines the reporting schedule should be changed, CDFW or the Service will notify Caltrans in writing of the new reporting schedule.

CESA-9: Annual Status Report. For appropriate CESA-listed covered species, Caltrans will provide CDFW and the Service with an Annual Status Report (ASR) no later than January 31 of every year project activities occur. Each ASR will include, at a minimum: (1) a summary of all

Monthly Compliance Reports for that year; (2) a general description of the status of the project area and activities, including actual or projected completion dates, if known; (3) a copy of notes showing the current implementation status of each mitigation measure; (4) an assessment of the effectiveness of each completed or partially completed mitigation measure in avoiding, minimizing, and mitigating project impacts; (5) all available information about project-related incidental take of the covered species; (6) an accounting of the number of acres subject to both temporary and permanent disturbance, both for the prior calendar year, and a total since project covered activities began; and (7) information about other project impacts on the covered species.

CESA-10: Final Mitigation Report. For appropriate CESA-listed covered species, no later than 45 days after completion of all mitigation measures, Caltrans will provide CDFW and the Service with a Final Mitigation Report. An approved biologist (BIO-7: Approved Biologist) will prepare the Final Mitigation Report which will include, at a minimum: (1) a summary of all Monthly Compliance Reports and all ASRs; (2) a copy of the notes showing when each of the mitigation measures were implemented; (3) all available information about incidental take of the covered species; (4) information about other project impacts on the covered species; (5) beginning and ending dates of covered activities; (6) an assessment of the effectiveness of conservation measures in minimizing and fully mitigating impacts of the taking on covered species; (7) recommendations on how mitigation measures might be changed to more effectively minimize take and mitigate the impacts of future projects on the covered species; and (8) any other pertinent information.

Compensatory Mitigation Framework

Caltrans will compensate for impacts to covered species, the habitats they occupy, and covered critical habitats. Specifically, Caltrans will compensate for unavoidable impacts that remain after implementing all appropriate conservation measures to avoid and minimize impacts to covered species and critical habitat.

Caltrans will provide compensation that meets the intent of the Service’s Mitigation Policy (Service 2023a) and Endangered Species Act Compensatory Mitigation Policy (Service 2023b). Caltrans will achieve this by replacing or providing substitute resources for covered species and critical habitat through the restoration, establishment, enhancement, or preservation of resources and their values, services, and functions.

Prior to initiating ground disturbing activities for projects implemented under this PBO, Caltrans will compensate for impacts by implementing the framework described in detail below.

<u>Applicability</u>

After Caltrans implements all appropriate measures to avoid and minimize impacts to covered species and critical habitats from individual projects conducted under this PBO (see Conservation Measures section), Caltrans will compensate for impacts when:

a. An individual project is determined to have Category 2[1] effects to a covered species or critical habitat; or
b. An individual project, regardless of Category 1 or 2 status, will result in permanent impacts[2] to occupied habitat[3] for covered species or will result in permanent impacts to critical habitat that contain PBFs; or
c. An individual project, regardless of Category 1 or 2 status, will have temporary impacts[4] to occupied habitat for covered species or will result in temporary impacts to critical habitat that contain PBFs.

Definition of Occupied Habitat

For the purposes of this compensatory mitigation framework, occupied habitat is defined as habitat where individuals of a covered species are known to occur or where individuals are presumed to occur. Caltrans will consider habitat to be occupied by individuals of covered species, and subject to the applicability criteria above, when:

a. Habitat is within the range of the species; and
b. Habitat is suitable to support the survival of individuals (e.g., breeding, feeding, or sheltering activities).

Caltrans will consider habitat that meets the above criteria as unoccupied by individuals of a species (i.e., absent), and not subject to compensation for permanent or temporary impacts only when the Service agrees that it is likely that the species is absent. Caltrans has committed to implementing surveys according to Service protocol, BIO-2: Covered Species-Specific Surveys. The Service will rely on the results of surveys conducted according to Service protocol and information contained within its files, when considering whether to agree with determinations by Caltrans that species are absent from project areas that meet the criteria found in (a) and (b) above.

It is often difficult to determine that a species is absent from habitat. For example, individuals may be difficult to detect through reconnaissance surveys because they utilize suitable habitat during limited time periods (e.g., migratory birds), exhibit a cryptic life history (e.g., ground dwelling amphibians), or only appear above ground at limited time intervals (e.g., annual plants). Surveys according to Service protocol, BIO-2: Covered Species-Specific Surveys, are designed to increase the reliability of survey efforts.

Clarification on Compensation for Impacts to Critical Habitat

Caltrans will compensate for permanent and temporary impacts to critical habitat that remain after incorporating all appropriate and practicable conservations measures to avoid and minimize

[1] See the Conservation Measures section of this PBO for definitions of Category 1 and 2.
[2] Refer to the Definition of Permanent Impacts section of this compensatory mitigation framework.
[3] Refer to the Definition of Occupied Habitat section of this compensatory mitigation framework.
[4] Refer to the Definition of Temporary Impacts section of this compensatory mitigation framework.

impacts. The Applicability section describes when Caltrans would provide compensatory mitigation for impacts to critical habitat. Occupation by individuals of a species is not a factor in determining when compensatory mitigation is required for impacts to critical habitat.

When Caltrans proposes a project that will have Category 2 impacts to critical habitat, or when Caltrans proposes a project that will permanently or temporarily impact critical habitat that contain PBFs, Caltrans will provide compensation consistent with Service policy (Service 2023a; Service 2023b).

Definition of Permanent Impacts

Permanent impacts are defined as changes to the land, air, or water that Caltrans will not return to pre-project conditions within one year or activities that result in injury or mortality of covered species. Permanent impacts from the proposed project will often result from activities that alter the land through soil disturbance; project activities are not likely to permanently change the air (e.g., through permanent increases in noise and dust) or water (e.g., through permanent increases in sedimentation). Permanent impacts from the proposed project include:

a. the physical footprint of all infrastructure installed as a part of the project (e.g., vaults, repeater hubs, access roads, maintenance vehicle pull outs);
b. impacts that result in a change to the breeding, feeding, sheltering, or survival function of an area for more than one year;
c. impacts that result in a reduction in productivity for a single breeding season or longer;
d. injury or mortality of an individual of a covered species (e.g., take in the form of harm);
e. projects that result in the removal of covered plants or a disruption of a soil seed bank for covered plants;
f. soil disturbance that Caltrans does not return to pre-project conditions by restoring the grade and species composition such that the soil disturbance cannot be considered temporary (see Definition of Temporary Impacts below);
g. all Category 2 impacts to covered vernal pool species and critical habitats. The extent of permanent impacts to vernal pools is the entirety of the wetted acres of aquatic features that occur, wholly or partially, within 250 feet of ground-disturbing project activities (i.e., above or below ground soil disturbance). If soil-disturbing activities occur within 250 feet of a vernal pool but the pool is not contiguous with those activity areas (i.e., separated by a compacted roadway or other complete barrier to the hydrology that supports the vernal pool), then the feature is unlikely to be permanently affected by the activities; and
h. any impact to suitable habitat for the Smith's blue butterfly, Santa Barbara Distinct Population Segment of the California tiger salamander, or any vernal pool species, regardless of the duration it takes to restore the habitat.

Definition of Temporary Impacts

Temporary impacts are defined as changes to the land, air, or water (e.g., through increases in noise, dust, lighting, erosion, and human activity) that Caltrans will return to pre-project conditions within one year. Temporary impacts include:

a. changes to the land, air, or water that cannot be meaningfully measured or detected within one year;
b. soil disturbance that Caltrans returns to pre-project conditions by implementing a Service approved restoration plan, which includes post-restoration monitoring (see BIO-4: Restore Temporarily Disturbed Occupied Habitat and Covered Critical Habitat); and
c. soil disturbance that Caltrans returns to pre-project conditions without implementing a Service approved restoration plan (e.g., Caltrans regrades and hydroseeds the impact area with an appropriate plant palette without post-restoration monitoring; see BIO-4: Restore Temporarily Disturbed Occupied Habitat and Covered Critical Habitat), and Caltrans provides 1:1 compensation offsite (see Compensation Ratios and Compensation Procedures sections below).

Compensation Ratios

Caltrans can utilize a range of conservation tools to compensate for impacts to covered species and critical habitats, including but not limited to, conservation banks, in-lieu fee programs, proponent-responsible mitigation (e.g., habitat restoration or land acquisition), species accounts, and species recovery actions of equal conservation value.

Caltrans will provide compensation that meets the intent of the Service's mitigation policies (Service 2023a; Service 2023b). Caltrans will work with the Service through technical assistance to ensure that compensation proposed by Caltrans is consistent with Service policy.

Caltrans will provide a compensation ratio of 3:1 (compensation:impact) for permanent impacts and 1:1 for temporary impacts. This ratio can be adjusted, with Service approval, through the Project Notification Report and Administration of the PBO section, depending on the circumstances of the project and the covered species or critical habitat that would be affected by the project.

If Caltrans does not propose a 3:1 ratio to compensate for permanent impacts from an individual project, or 1:1 ratio for temporary impacts, Caltrans will provide the Service with justification for the deviation from those ratios that describes how the deviation meets the intent of the Service's mitigation policies. For example, Caltrans could utilize existing models to propose alternative compensation procedures or ratios for impacts to covered species or critical habitats (e.g., for existing compensation procedures utilizing models for the Santa Barbara County DPS of the California tiger salamander).

Special circumstances where alternate ratios may be required to meet the intent of the Service's mitigation policies include:

a. Core areas of the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Service 2005), in coordination with the Service's Sacramento Fish and Wildlife Office for technical assistance (19:1 compensation ratio likely required for rarer species; e.g., Butte County meadowfoam);
b. If Caltrans will impact Smith's blue butterfly or its host plants, Caltrans will coordinate with the Service's Ventura Fish and Wildlife Office for technical assistance (3:1 compensation ratio for host plants that are lost or degraded with at least five years of monitoring of restored habitat which includes adaptive management to ensure the success of restoration is required); and
c. Compensation for impacts to the California tiger salamander Santa Barbara distinct population segment should follow the strategy outlined in the *Santa Barbara County Distinct Population Segment of the California Tiger Salamander Conservation Strategy and Mitigation Guidance* (Service 2020).

<u>Compensation Procedures</u>

Caltrans will implement compensation activities to offset impacts to covered species and critical habitats in advance of impacts. This is often best achieved by conservation banks, then in-lieu fee programs, then proponent-responsible mitigation, and finally species recovery actions.

When Caltrans compensates for impacts to covered species and critical habitat, Caltrans will provide proposed plans to offset permanent and temporary impacts to the Service, and CDFW as applicable, with the Project Notification Report. The Service and CDFW will review plans to compensate for impacts submitted by Caltrans with the Project Notification Report and notify Caltrans within 30 days if the plan is approved or denied. Caltrans will not initiate ground disturbing activities associated with the project within the 30-day review period until the Project Notification Report is approved by the Service, and CDFW if applicable (see Administration of the PBO section). If the Service or CDFW denies the Project Notification Form for any reason, Caltrans will not initiate ground disturbing activities until the issues are resolved with the Service and CDFW. Caltrans can coordinate with the Service through technical assistance regarding proposed plans for compensation prior to submitting the Project Notification Report.

When Caltrans proposes to use conservation banks or in-lieu fee programs to compensate for impacts, Caltrans will identify in the Project Notification Report to the Service the bank or in-lieu fee program, describe the offsetting amount (e.g., number of credits), and timing of payment. Compensation will be implemented prior to impacts to covered species or critical habitats.

When Caltrans proposes to use proponent-responsible mitigation to compensate for impacts to covered species and critical habitat, Caltrans will provide detailed plans that describe the compensation methods, funding assurances for any restoration activities and long-term management (e.g., endowment), land protection instrument (e.g., conservation easement), and monitoring requirements to ensure the compensation achieves the intent of the Service's mitigation policies. The detailed plan will be included in the Project Notification Report submitted to the Service. Compensation will be initiated prior to impacts to covered species or critical habitats.

When Caltrans proposes to use species recovery actions to compensate for impacts, Caltrans will provide in the Project Notification Report to the Service a justification for how the actions are of equal conservation value to the resources impacted to meet the intent of the Service's mitigation policies. Compensation will be provided prior to impacts to covered species or critical habitats.

ADMINISTRATION OF THE PBO

The analysis contained within this PBO considers how the proposed action, as a whole (i.e., across the SHS in California), will affect the species and critical habitats listed in Table 1 and (for the PLOC) Table 2. However, Caltrans will implement the project in smaller sections (i.e., individual projects). Individual MMBN projects will vary in size but are likely to be approximately 1 to tens of miles long.

Caltrans will identify individual MMBN projects that may affect listed species and critical habitats and will evaluate whether the project is consistent with the analysis contained within this PBO. Caltrans will seek technical assistance from the Service as needed regarding project consistency with this PBO.

When Caltrans proposes to implement projects in a manner not consistent with this PBO (e.g., an individual project is located outside of the action area of this PBO, may affect species not analyzed in this PBO, or is likely to result in effects to the species or critical habitats listed in Table 1 or Table 2 beyond what is described in this PBO), Caltrans' obligations under section 7(a)(2) of the Act will not be met through the analysis in this PBO. In such a case, Caltrans will not proceed with the proposed project until after Caltrans contacts the Service and the effects of that project are adequately addressed in a separate consultation with the Service.

Requirements for Coverage (Eligibility Criteria)

Caltrans will determine project eligibility using a Project Notification Report. The following conditions must be met for a proposed project to use the PBO:

1) Proposed project activities are consistent with the Description of the Proposed Action.

    - If a project includes any activities that are not described above, then Caltrans will request a separate section 7 consultation.

2) Species and critical habitats potentially affected by an individual project are covered by the PBO (Table 1) or PLOC (Table 2).

3) All project activities will occur within Caltrans' rights-of-way, or within 30 feet of the rights-of-way along State Highway System routes identified in the PBA and within the Action Area included in the PBO.

    - If a project is located outside of the Caltrans' rights-of-way or outside 30 feet of the rights-of-way, or is outside of the Action Area included in the PBO, then Caltrans will request a separate section 7 consultation.

4) Caltrans must implement all applicable General and Species/Taxa-specific Conservation Measures.

5) Project-level effects determinations must be the same or lower than the effects determinations in this PBO (Table 1) and PLOC (Table 2) for each species and critical habitat the project may affect.

    - Covered species or critical habitats with a programmatic LAA determination (Table 1) can have a project-level determination of LAA, NLAA, or No Effect.
    - Covered species or critical habitats with a programmatic NLAA determination can have a project-level determination of NLAA or No Effect. If a project-level determination is LAA for these covered species and critical habitats, then Caltrans will request a separate section 7 consultation.

Programmatic Administration Tasks

Step 1. Caltrans will request an official species list in IPaC for all MMBN projects that it carries out or authorizes (e.g., through the issuance of a right-of-way permit).

a) Caltrans will include the acronym MMBN in the IPaC project title.

Step 2. Caltrans will review the proposed project and determine if it may affect any listed species or critical habitat.

a) If no species or critical habitat may be affected, Caltrans will document their "no effect" determination and continue with the project without further coordination with the Service.

b) If any listed species or critical habitat may be affected, Caltrans will continue to Step 3.

Step 3. Caltrans will conduct an initial review to determine whether an individual MMBN project meets the Eligibility Criteria.

a) Caltrans will review this PBO and will confirm whether the proposed activities are consistent with the Description of the Proposed Action section of this PBO;

b) Caltrans will determine if any species may be affected on the IPaC list that are not included in Table 1 or Table 2 of this PBO;

c) Caltrans will determine whether the effects of the proposed project are wholly contained within the Action Area covered by this PBO (see the Environmental Baseline section).

d) Caltrans will confirm whether all project activities are within Caltrans right-of-way or within 30 feet of the right-of-way.

Step 4. Caltrans will determine the Conservation Measure approach (i.e., Category 1 or Category 2) for each entity on the IPaC species list that the project may affect. Species or critical habitats for which Caltrans determines that the project will have no effect can be excluded from this step.

- *Category 1*—conservation measures that, when implemented with the proposed General conservation measures, would avoid or minimize effects such that they are insignificant or discountable for a given species or critical habitat. This level of effect is addressed by the PLOC (for species and critical habitats with a determination of NLAA in Table 2) or by this PBO (for species and critical habitats with a determination of LAA in Table 1).

- *Category 2*—conservation measures that will be implemented when project activities would have adverse effects to a given species or critical habitat. Category 2 would be applicable only to covered species and critical habitats addressed in this PBO and listed in Table 1 (not those addressed by the PLOC as listed in Table 2). When implementing Category 2 measures, Caltrans will also implement all General, Category 1 (unless deemed impracticable), and Category 2 conservation measures necessary to reduce the extent and magnitude of adverse effect. The most protective measure will be used and may modify or replace any other measures.

Step 5. Caltrans will ensure that applicable BMPs and conservation measures are included in the individual MMBN project's construction contract plans and specifications.

Step 6. Caltrans will submit a Project Notification Report as described in the Project Review section below. Caltrans will not submit a Project Notification Report until it has determined that the entire project is consistent with this PBO or PLOC.

Step 7. After Caltrans submits a complete Project Notification Report, the Service will review the report and respond within 30 days. The project will not commence until:

a) the Service responds in agreement that the project is consistent with this PBO; or

b) after 30 days following Caltrans' submittal of the Project Notification Report, if the Service has not issued a response. It is ultimately Caltrans' responsibility to be compliant with the Act, which includes ensuring MMBN projects are consistent with the analysis contained in this PBO.

If the Service disagrees with Caltrans' determination that the project is consistent with this PBO, the project will not commence until additional project details are provided or the project is modified such that the Service and Caltrans both agree that the project is consistent, or the Service completes a standalone consultation for the project if requested by Caltrans.

Step 8. Caltrans will ensure that biologists have been approved by the Service to conduct work when required under various conservation measures as described in BIO-7: Approved Biologist.

Step 9. Caltrans will routinely coordinate with the Service and complete all reporting requirements, as described below in the Project Review, Monitoring, and Reporting section.

Project Review, Monitoring, and Reporting

Project Review

Caltrans will complete and submit a Project Notification Report and attach construction plans, technical studies, and any other applicable reporting elements such as mitigation or restoration plans.

When the Project Notification Report is submitted, Caltrans acknowledges that it has determined that the proposed project is consistent with this PBO. If Caltrans is unsure or would like to engage in technical assistance with the Service, Caltrans should contact the local Service field office to discuss the proposed project through early coordination prior to submission of the Project Notification Report.

After a Project Notification Report is submitted, the Service has 30 calendar days to review the report and respond in writing if it disagrees with Caltrans' determination that the project is consistent with this PBO. Projects will not commence during this review period. Complex issues should be discussed between Caltrans and Service field office staff through early coordination and technical assistance so that Project Notification Reports contain agreeable solutions.

The Project Notification Report will include the following elements, at minimum:

- description of covered activities;
- Caltrans' effects determination for each species and critical habitat on the IPaC species list created for the individual project;

- quantities (acres) of temporary and permanent impacts to covered species and covered critical habitats, including a description of the net changes to covered species habitats and covered critical habitats after incorporation of mitigation plans (as needed);
- figures depicting areas of impact relative to habitat features for covered species and covered critical habitats;
- list of project-specific general and species-specific conservation measures that will be implemented to avoid, minimize, and compensate (as applicable) for impacts;
- required attachments:
    - IPaC Official Species list with project area map;
    - species habitat and critical habitat assessments (see BIO-1);
    - species survey results (see BIO-2),
    - restoration plans (see BIO-4);
    - approved biologist credentials (see BIO-7);
    - exclusion fencing plans (see BIO-16);
    - relocation or salvage plans (as applicable; see MAM-7, REP-6; AMPH-6; INSECT-5, and PLANT-4);
    - compensatory mitigation plans or proposals; and
    - any other documents listed in applicable conservation measures.

Caltrans may include a Natural Environmental Study, biological assessment, or other similar document as an attachment to the PNR.

Project Monitoring

For projects covered under this PBO, an approved biologist (see BIO-7: Approved Biologist) will monitor project activities, impacts, and schedule to ensure projects are implemented consistently with the PBO and PNR, and to facilitate timely and accurate communications between Caltrans and the Service.

Project Reporting

Each year, Caltrans will submit an annual report that includes: 1) project completion reports from all projects completed in that calendar year; and 2) a summary accounting (i.e., total) of both actual and proposed (estimated) permanent and temporary impacts to covered species and covered critical habitats and take of covered species. Caltrans will deliver the annual report to the Service by March 1 each year, until MMBN is completed, or no additional individual projects are proposed. The accounting of actual impacts and take is the sum of all projects that have been completed through the end of the calendar year. The accounting of proposed (estimated) impacts and take is the sum that is likely to occur in the upcoming year as described in completed PNRs.

By providing the summary accounting in the annual report, Caltrans will document its consistency to the limits analyzed within this PBO. Caltrans will track actual and proposed impacts and take using an internal tracking mechanism to ensure incidental take not exceeded.

Caltrans will include in the annual report a post-construction report for each project that was completed within the calendar year. Post-construction reports will summarize and quantify actual habitat impacts that occurred; list the identity and numbers of each species injured or killed; list general and species-specific conservation measures implemented during the project; and discuss issues encountered during construction pertinent to this PBO, including how they were resolved. Caltrans can include pre- and post-disturbance photographs, and other evidence of compliance with conservation measures as identified in this PBO, as needed. If covered species are handled or relocated, the following information will also be provided: name(s) of the approved biologist(s); capture and relocation methods (including description of area surveyed, time and date of survey); the number of all covered species capture, handled, or relocated; and a detailed discussion of capture and relocation efforts.

Caltrans will additionally host quarterly meetings with the Service to coordinate the following: share and discuss detailed tracking of projects anticipated to be consistent with this PBO; communicate status updates for current and planned projects that have completed the PNR consistency review process; and share additional project information as requested. Caltrans will use information provided in quarterly meeting and in the annual report to evaluate the status of this PBO for internal planning and for external tracking and compliance.

Annual Evaluation Meeting

Caltrans and the Service will meet annually for a comprehensive evaluation of the details of this PBO, including the covered activities, required general and species-specific conservation measures, proper planning and administrative communications for use of this PBO, take limits for each species and work limits for specific covered activities, and required communications and reporting. The annual meeting will also provide a forum for collaborative discussions of lessons learned and project examples. This annual meeting will provide a transparent forum for questions and answers from all parties.

Elevation and Issue Resolution

Caltrans proposes that if an issue cannot be resolved among the primary Caltrans or Service staff (e.g., regarding whether a project is consistent with the PBO), the issue will be elevated to the management level at the Caltrans district and Service field office. Managers and staff will then meet to discuss the issues and will work together to reach an agreement within 30 days. Issues will be elevated to Caltrans' headquarters and the Service regional office if consensus cannot be reached. If the issue cannot be resolved within 30 days, the issue will be raised to the next higher level of each agency.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

Jeopardy Determination

Section 7(a)(2) of the Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02).

The jeopardy analysis in this biological opinion relies on four components: (1) the Status of the Species, which describes the current rangewide condition of the covered species, the factors responsible for that condition, and its survival and recovery needs; (2) the Environmental Baseline, which analyzes the condition of the covered species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the covered species; (3) the Effects of the Action, which determines all consequences to the covered species caused by the proposed action that are reasonably certain to occur in the action area; and (4) the Cumulative Effects, which evaluates the effects of future, non-Federal activities, that are reasonably certain to occur in the action area.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the current status of the covered species, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to reduce appreciably the likelihood of both the survival and recovery of the covered species in the wild by reducing the reproduction, numbers, and distribution of that species.

Adverse Modification Determination

Section 7(a)(2) of the Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to destroy or to adversely modify designated critical habitat. Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.

The destruction or adverse modification analysis in this biological opinion relies on four components: (1) the Status of Critical Habitat, which describes the rangewide condition of the critical habitat for the covered species; (2) the Environmental Baseline, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; (3) the Effects of the Action, which are all consequences to critical habitat caused by the proposed action that are reasonably certain to occur in the action area; and (4) Cumulative Effects, which evaluate the effects of future non-Federal activities in the action area that are reasonably certain to occur.

For the section 7(a)(2) determination regarding destruction or adverse modification of critical habitat, the Service begins by evaluating the effects of the proposed Federal action and any cumulative effects. The Service then examines those effects against the condition of all critical habitat described in the listing designation to determine if the proposed action's effects are likely to appreciably diminish the value of critical habitat as a whole for the conservation of the species.

STATUS OF THE SPECIES AND CRITICAL HABITATS

The Status of the Species describes the current range-wide condition of the species, the factors responsible for that condition, and its survival and recovery needs. The Status of Critical Habitats describes the range-wide condition of the critical habitat for the species. When discussing critical habitat, the phrases "primary constituent elements" (PCEs) and "physical and biological features" (PBFs) are synonymous. Critical habitat rules published before February 11, 2016, used the term PCE, while critical habitat rules published after that date use the term PBF. In cases where a critical habitat rule numbers PCEs specifically (e.g., PCE-1, PCE 1), we will use the terms as defined in the critical habitat designation to avoid confusion.

Due to the volume of species and critical habitats addressed in this PBO, we combined the above information into a single document, Appendix A. Refer to Appendix A for the Status of the Species and Status of Critical Habitats for all of the covered species and covered critical habitats described in this PBO.

ENVIRONMENTAL BASELINE

The implementing regulations for section 7(a)(2) (50 CFR 402.02) define the environmental baseline as "the condition of the listed species or its designated critical habitat in the action area, without the impacts to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Theimpacts to listed species or designated critical habitat fromFederal agency activities or existing Federal agency facilities that are not within the agency's discretion to modify are part of the environmental baseline."

Action Area

The implementing regulations for section 7(a)(2) of the Act (50 CFR 402.02) define the "action area" as all areas affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. The action area for this PBO occurs in an area along approximately 10,000 miles of SHS rights-of-way in which Caltrans proposes to install broadband internet infrastructure and, occasionally, areas outside but near rights-of-way where Caltrans proposes to construct network hubs. We describe the extent of the action area in terms of the maximum possible extent, which is based on:

- Temporary and permanent ground-disturbing construction activities, including excavation, grading, and placement of fill. These areas are generally associated with the project footprint; and

- Noise, visual, and human disturbances which may occur outside, or extend beyond, the project footprint.

The lateral extent of the action area along the SHS ultimately varies depending on site-specific conditions, the specific covered species that may be present, the specific construction activities being conducted, and the construction methods employed by Caltrans. We anticipate that construction noise would be the effect with the largest geographic extent. The level of noise and distance of effect would vary depending on the specific construction action, background noise levels, vegetation, and topography. For purposes of estimating the maximum potential extent of the action area based on noise, Caltrans modeled the distance at which the loudest piece of construction equipment, a concrete/asphalt saw, would extend if located on a rural highway with low background noise. In this scenario, construction noise of 90 A-weighted decibels (dBA) would attenuate to a background noise level of 50 dBA approximately 1,990 feet from the source (Caltrans 2023, 2024).

Because projects could be located anywhere along the SHS and up to 30 feet outside the right-of-way, the maximum extent of the action area for this PBO is up to 2,220 feet from Caltrans' right-of-way.

Habitat Characteristics, Existing Conditions, and Recovery Function of the Action Area

The Caltrans rights-of-way typically include existing roadway, road shoulder, and natural or developed areas beyond the shoulder subject to ongoing maintenance and operation. Areas outside the rights-of-way within the action area may include private properties and parcels owned or managed by other federal, state, or local government agencies.

Throughout the action area, a variety of past actions have resulted in the degradation of habitat potentially suitable for covered species in the action area. Natural habitats and adjacent natural communities have been removed, degraded, or altered by construction of roadways and associated infrastructure. Areas within and adjacent to the Caltrans rights-of-way continue to be affected by continued vehicle use and maintenance and operations activities.

The baseline conditions for covered species and suitable habitat, and the PBFs associated with designated critical habitat, have been altered and degraded through the following:

- Changes in grade, including cut and fill slopes
- Noise impacts
- Visual impacts
- Loss of connectivity
- Fencing
- Divided medians, with and without barriers
- Construction of culverts and other water crossing structures
- Roadway under- and overcrossings
- Hydrological alteration
- Trash and debris
- Toxic pollution
- Fire suppression or frequent fire
- Vegetation management
- Impervious surfaces

The magnitude of these past and present actions’ effects on covered species is influenced by the species’ specific life history characteristics and by adjacent land uses. Roadways in rural areas typically are broadly conducive to wildlife movement, have minimal noise and visual impacts, and are surrounded by higher quality natural habitats with minimal development. Suburban areas have moderate noise and visual impacts, may have areas that are less conducive to wildlife movement, and are surrounded by a mixture of natural habitats and urban development. The natural habitats present may vary in quality. Urban roadways typically have high levels of noise and visual impacts; include fencing, divided medians, hydrological alterations, and undercrossings and overcrossings; and are minimally conducive to wildlife movement. These areas are surrounded by urban development and have few areas of natural habitats. The natural habitat present may be of poor quality for covered species.

Caltrans describes the biogeographic regions occurring in California along with the defining characteristics of each, plus the habitat types present in the action area in Section 3.2 of the PBA (Caltrans 2023, 2024). Please refer to the PBA for more detailed discussion of the habitat characteristics of the action area.

Condition (Status) of the Species in the Action Area

As discussed in the Anticipated Permanent and Temporary Impacts, and Self-Imposed Limits section of this PBO, Caltrans used a habitat association model to estimate the amount of suitable habitat for covered species at two scales: throughout the species' range, and in the MMBN study area (within 500 feet of left-aligned SHS centerlines). This information is shown in Table 18.

Condition (Status) of Critical Habitat in the Action Area

As discussed in the Anticipated Permanent and Temporary Impacts, and Self-Imposed Limits section of this PBO, Caltrans calculated and compared the amount of covered critical habitat within the MMBN study area (within 500 feet of left-aligned SHS centerlines) to the total amount of covered critical habitat. This information is shown in Table 19.

Table 18. Amount of covered species suitable habitat within California compared to amount within the study area.

Species	Suitable Habitat in Range (acres)	Suitable Habitat in Study Area (acres)	Percent of Suitable Habitat in Study Area
Mammals			
Buena Vista Lake ornate shrew	247,870	1,600	0.65
Giant kangaroo rat	2,659,073	23,079	0.87
Peninsular bighorn sheep	734,521	2,007	0.27
Point Arena mountain beaver	33,128	217	0.66
Salt marsh harvest mouse	298,477	5,419	1.82
San Bernardino Merriam’s kangaroo rat	926,802	16,444	1.77
Stephens’ kangaroo rat	272,853	5,346	1.96
Tipton kangaroo rat	1,109,216	10,359	0.93
Birds			
California Ridgway’s rail	225,168	2,138	0.95
California spotted owl, Coastal-Southern California DPS	1,022,416	8,656	0.84
California spotted owl, Sierra Nevada DPS	7,786,776	57,097	0.73
Coastal California gnatcatcher	3,006,962	33,024	1.10
Least Bell’s vireo	120,190	3,346	2.78
Northern spotted owl	9,177,646	63,231	0.69
Southwestern willow flycatcher	255,730	7,191	2.81
Yuma Ridgway’s rail	264,010	232	0.09
Reptiles			
Alameda whipsnake	656,065	4,102	0.63
Blunt-nosed leopard lizard	357,076	4,967	1.39
Coachella Valley fringe-toed lizard	205,087	2,767	1.35
Giant garter snake	1,145,413	13,895	1.21
Northwestern pond turtle	32,284,764	301,399	0.93

Species	Suitable Habitat in Range (acres)	Suitable Habitat in Study Area (acres)	Percent of Suitable Habitat in Study Area
San Francisco garter snake	5,886	160	2.72
Southwestern pond turtle	7,215,093	83,103	1.15
Amphibians			
Arroyo toad	1,285,756	10,891	0.85
California red-legged frog	14,024,887	143,650	1.02
California tiger salamander, Central California DPS	6,430,201	57,607	0.90
California tiger salamander, Santa Barbara County	126,088	2,059	1.63
California tiger salamander, Sonoma County	80,686	1,244	1.54
Kern Canyon slender salamander	37,514	766	2.04
Relictual slender salamander	30,553	986	3.23
Western spadefoot, northern DPS	20,828,094	215,103	1.03
Western spadefoot, southern DPS	3,863,302	47,180	1.22
Insects			
Bay checkerspot butterfly	41,145	795	1.93
Behren’s silverspot butterfly	27,955	5,631	20.14
Callippe silverspot butterfly	45,194	760	1.68
Casey’s June beetle	993	33	3.31
Delhi sands flower-loving fly	3,190	30	0.96
Mission blue butterfly	27,852	651	2.34
Monarch butterfly	22,633,485	224,074	0.99
Mount Herman June beetle	1,122	8	0.72
Myrtle’s silverspot butterfly	79,044	3,451	4.37
Oregon silverspot butterfly	5,352	284	5.31
Quino checkerspot butterfly	418,414	7,766	1.86
San Bruno elfin butterfly	1,643	54	3.31
Smith’s blue butterfly	61,266	817	1.33

Species	Suitable Habitat in Range (acres)	Suitable Habitat in Study Area (acres)	Percent of Suitable Habitat in Study Area
Valley elderberry longhorn beetle	88,383	1,131	1.28
Crustaceans			
Conservancy fairy shrimp	4,870,952	68,206	1.40
Longhorn fairy shrimp	248,680	204	0.08
Riverside fairy shrimp	293,368	6,474	2.21
San Diego fairy shrimp	82,077	1,048	1.28
Vernal pool fairy shrimp	9,647,699	117,061	1.21
Vernal pool tadpole shrimp	4,765,587	59,679	1.25
Plants			
Baker's larkspur	64,071	2,145	3.35
Beach layia	9,188	213	2.31
Ben Lomond wallflower	2,980	34	1.12
Butte County meadowfoam	71,675	2,249	3.14
California Orcutt grass	143,064	3,201	2.23
Chorro Creek bog thistle	504,121	3,726	0.74
Coachella Valley milk-vetch	117,046	1,921	1.64
Colusa grass	320,186	1,020	0.32
Contra Costa goldfields	480,618	12,439	2.59
Cushenbury buckwheat	90,844	1,070	1.18
Few-flowered navarretia	19,391	742	3.83
Fleshy owl's clover	492,060	4,125	0.84
Gentner's fritillary	43,211	993	2.30
Greene's tuctoria	315,815	3,374	1.07
Hairy Orcutt grass	240,854	2,678	1.11
Hoover's spurge	147,845	1,886	1.28
Howell's spineflower	1,285	133	10.34

Species	Suitable Habitat in Range (acres)	Suitable Habitat in Study Area (acres)	Percent of Suitable Habitat in Study Area
Ione buckwheat	5,549	103	1.86
Ione manzanita	67,516	2,140	3.17
Kern mallow	313,374	4,408	1.41
Layne's butterweed	89,971	1,886	2.10
Loch Lomond coyote thistle	4,800	316	6.58
Many-flowered navarretia	22,193	853	3.84
Menzie's wallflower	1,771	227	12.81
Monterey spineflower	132,637	1,931	1.46
Nipomo Mesa lupine	1,056	39	3.72
Palmate-bracted bird's beak	84,738	1,016	1.20
Parish's daisy	208,471	1,492	0.72
Pedate checker-mallow	413	50	12.14
Pine Hill ceanothus	16,611	141	0.85
Pismo clarkia	285,945	2,017	0.71
Sacramento Orcutt grass	90,811	1,004	1.11
San Bernardino bluegrass	1,039	50	4.82
San Diego ambrosia	119,920	2,067	1.72
San Diego button-celery	134,603	1,375	1.02
San Diego mesa-mint	27,620	537	1.95
San Jacinto Valley crownscale	21,162	360	1.70
San Joaquin Valley Orcutt grass	313,205	2,268	0.72
San Joaquin wooly-threads	906,842	7,107	0.78
Santa Clara Valley dudleya	93,683	860	0.92
Santa Monica Mountains dudleya	64,980	374	0.58
Slender Orcutt grass	408,256	5,189	1.27
Spreading navarretia	1,070,190	12,700	1.19

Species	Suitable Habitat in Range (acres)	Suitable Habitat in Study Area (acres)	Percent of Suitable Habitat in Study Area
Stebbins' morning-glory	17,980	124	0.69
Thread-leaved brodiaea	279,258	3,681	1.32

Table 19. Amount of total critical habitat rangewide compared to amount of critical habitat within the study area.

Critical Habitat	Total Critical Habitat	Critical Habitat in Study Area (acres)	Percent of Critical Habitat in Study Area
Mammals			
Peninsular bighorn sheep	377,419	614	0.16
San Bernardino Merriam's kangaroo rat	33,316	1,471	4.41
Birds			
Coastal California gnatcatcher	197,409	3,297	1.67
Least Bell's vireo	36,988	1,361	3.68
Northern spotted owl	2,101,785	6,478	0.31
Southwestern willow flycatcher	39,188	1,053	2.69
Reptiles			
Alameda whipsnake	156,283	226	0.14
Amphibians			
California red-legged frog	1,640,467	11,833	0.72
California tiger salamander–Central Valley DPS	199,070	4,237	2.13
California tiger salamander–Santa Barbara DPS	11,176	383	3.43
California tiger salamander–Sonoma DPS	47,418	1,536	3.24

Critical Habitat	Total Critical Habitat	Critical Habitat in Study Area (acres)	Percent of Critical Habitat in Study Area
Insects			
Bay checkerspot butterfly	18,301	126	0.69
Quino checkerspot butterfly	62,174	1,028	1.65
Crustaceans			
Vernal pool fairy shrimp	590,007	6,440	1.09
Vernal pool tadpole shrimp	228,784	3,483	1.52
Plants			
Ash-grey paintbrush	1,768	75	4.23
Bear Valley sandwort	1,412	53	3.72
Butte County meadowfoam	16,644	684	4.11
Colusa grass	152,033	122	0.08
Contra Costa goldfields	14,739	454	3.08
Cushenbury buckwheat	6,959	92	1.32
Cushenbury milk-vetch	4,370	125	2.87
Cushenbury oxytheca	3,151	72	2.29
Fleshy owl's-clover	175,746	1,849	1.05
Greene's tuctoria	145,051	8	0.01
Hairy Orcutt grass	79,557	845	1.06
Hoover's spurge	114,867	144	0.13
La Graciosa thistle	24,094	1,406	5.84
Monterey spineflower	11,057	148	1.34

Critical Habitat	Total Critical Habitat	Critical Habitat in Study Area (acres)	Percent of Critical Habitat in Study Area
Parish's daisy	4,424	178	4.03
Sacramento Orcutt grass	33,277	908	2.73
San Diego ambrosia	1,113	46	4.12
San Joaquin Orcutt grass	136,189	884	0.65
Slender Orcutt grass	94,692	1,273	1.34
Southern mountain wild-buckwheat	903	53	5.82
Spreading navarretia	6,726	94	1.40
Vandenberg monkeyflower	5,727	164	2.86
Ventura Marsh milk-vetch	426	26	6.12
Yadon’s piperia	2,118	66	3.11
Yellow larkspur	2,518	458	18.20

EFFECTS OF THE ACTION

The implementing regulations for section 7(a)(2) define effects of the action as "all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action but that are not part of the action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action" (50 CFR 402.02).

In conducting this analysis, we have considered factors such as previous consultations, Federal Register rules, 5-year reviews, conservation agreements, published scientific studies and literature, professional expertise of Service personnel, information obtained from other academic researchers or experts particularly dealing with aspects directly related to the sensitive species involved, species threats assessments, or other related documents in determining whether effects are reasonably certain to occur. We have also determined that certain consequences are not caused by the proposed action, such as the increase or spread of disease, poaching, or collecting, because they are so remote in time, or geographically remote, or separated by a lengthy causal chain, so as to make those consequences not reasonably certain to occur.

Effects of the Action on Mammals

Any covered mammals or mammal critical habitats that occur within the action area could be adversely affected by project activities. Caltrans would avoid or minimize effects to covered mammals by implementing general and mammal-specific conservation measures. Implementing these measures would establish seasonal work windows to avoid the species' peak breeding season, establish avoidance buffers around burrows, complete preconstruction surveys, and monitor construction, among other measures. Here we describe potential adverse effects to covered mammals and mammal critical habitats, in general. We further list relevant effects for each covered mammal and mammal critical habitat in their respective subheading.

Effects to Species

We anticipate that adverse effects to covered mammals could include the following:

- *Increased erosion and sedimentation* – Project activities that involve removal of vegetation and disturbance of soils, like trenching or plowing, could result in increased erosion and sedimentation. This could cause adverse effects such as degradation of suitable habitat, and potentially bury or entrap covered mammals, particularly individuals of a fossorial species. These effects would be limited to the construction phase and would be minimized by implementation of conservation measures which will reduce project activities during rain events, as well as establish work windows and activity buffers around burrows and other sensitive habitats. Implementing these measures will reduce the potential for adverse effects on covered mammals due to erosion and sedimentation.

- *Increased noise and vibration* – Operation of heavy equipment could result in localized increases in noise and vibration. Increased noise and vibration could temporarily impair essential behaviors, including breeding, foraging, and sheltering, if individuals utilize sub-optimal habitats to avoid noisy areas. These effects would be limited to the construction phase and would be avoided and minimized by implementation of conservation measures. These measures include limiting construction activities to specific times of year and avoid covered mammal species' sensitive life history events (e.g., breeding season), completion of surveys to identify any occupied areas, and establishing avoidance buffers around suitable habitats and active burrows. Implementing these measures will reduce the potential for adverse effects on covered mammals due to increased noise and vibration.

- *Changes in topography* – Project activities that involve excavation, including conduit and vault installation, could result in temporary changes in topography. Locations of vaults, maintenance vehicle pullouts, and network hubs would also require excavation and would result in minor, localized changes in topography. Temporary changes in topography could result in the entrapment of covered mammals and confine individuals to excavated areas with no escape, which may expose individuals to predation, increase stress, and impair essential behaviors. These consequences would be avoided and minimized by implementation of conservation measures which will avoid installation of permanent infrastructure (i.e., vaults, maintenance vehicle pullouts, and network hubs) in suitable habitat, restore and recontour topography to original grade, prevent species entrapment, and establish avoidance buffers around suitable habitats and active burrows. Implementing these measures will reduce the potential for adverse effects on covered mammals due to changes in topography.

- *Introduction of invasive plants* – Project activities may introduce non-native plant species that alter the composition of suitable species habitats. For example, seeds of invasive plants may become lodged in construction vehicle tires from within or outside the action area, then be deposited into the action area during construction. In addition, ground disturbing activities, including those that remove vegetation or alter the substrate, may lead to increased colonization by invasive species. Caltrans will implement conservation measures to avoid or minimize the risk of introducing or spreading invasive plants.

- *Changes in dispersal, movement, or migration* – Operation of heavy equipment and presence of construction personnel could result in changes in dispersal, movement, or migration of covered mammals. These changes would be limited to the construction phase and would be expected to result in minor shifts in individual dispersal, movement, or migration. These effects will be minimized through implementation of conservation measures, including design measures, that identify covered mammals present in or near work areas, stopping work within areas immediately adjacent to observed species within suitable buffers, avoiding construction activities during species' sensitive life history periods, and establishing avoidance buffers around suitable habitats and active burrows. Implementation of these measures would reduce potential adverse effects to covered mammals' dispersal, movement, or migration.

- *Disturbance or removal of surface/subsurface refugia or hibernacula* – Project activities that involve excavation, ground disturbance, or vegetation removal could disturb or remove refugia or hibernacula used by covered mammals, which could impair essential sheltering behavior. This could include destruction of subsurface burrows or the removal of features such as snags, other woody debris, and leaf litter. These effects will be minimized through implementation of conservation measures, including design measures, which will ensure that suitable habitat is avoided and that temporarily disturbed areas are revegetated. Implementing these measures will reduce the potential for adverse effects on covered mammals due to disturbance or removal of surface/subsurface refugia or hibernacula.

- *Vehicle strikes* – Vehicles or construction equipment could contact or crush covered mammals, leading to injury or death. Species that are slow moving or immobile (e.g., Buena Vista Lake ornate shrew) are more susceptible to these impacts as they may not be able to escape or perceive the vehicle in time. Vehicle strikes will be minimized by implementing conservation measures that avoid suitable habitat and known populations, as well as implementing BMPs such as preconstruction surveys, daily clearance surveys, and vehicle speed limits.

- *Physical capture, collection, or handling* –Relocation during construction activities would result in the capture and handling of individual covered mammal species. Capturing and handling individuals that would otherwise be subject to more severe adverse effects may result in injury or mortality, but we anticipate that rates of injury or mortality would be much lower than if Caltrans did not attempt to relocate covered mammals at risk of more severe effects. Implementation of a relocation plan would minimize the adverse effects to covered mammals resulting from physical capture, collection, or handling.

Buena Vista Lake Ornate Shrew

We expect that adverse effects to Buena Vista Lake ornate shrew could include increased erosion and sedimentation; increased noise and vibration; changes in topography; changes in dispersal, movement, or migration; disturbance or removal of surface/subsurface refugia or hibernacula; vehicle strikes; and physical capture, collection, or handling. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Buena Vista Lake ornate shrews are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the Buena Vista Lake ornate shrew rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of Buena Vista Lake ornate shrews could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that project activities, including capture, may result in mortality or injury of up to 5 individuals, but such mortality or injury would be spread across multiple populations, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 32.28 acres of modeled Buena Vista Lake ornate shrew habitat and permanently affect up to 0.13 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 247,870 acres of suitable habitat for the Buena Vista Lake ornate shrew throughout the species' range, of which 1,600 acres (0.65 percent) occur within the study area. Therefore, project activities may affect up to 0.013 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Buena Vista Lake ornate shrew by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Buena Vista Lake ornate shrew.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the Buena Vista Lake ornate shrew. Project activities would not increase the regional threats currently affecting the Buena Vista Lake ornate shrew as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Giant Kangaroo Rat</u>

We expect that adverse effects to giant kangaroo rat could include increased erosion and sedimentation; increased noise and vibration; changes in topography; changes in dispersal, movement, or migration; disturbance or removal of surface/subsurface refugia or hibernacula; vehicle strikes; and physical capture, collection, or handling. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where giant kangaroo rats are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the giant kangaroo rat rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). The decreased breeding success of the limited number of giant kangaroo rat exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of giant kangaroo rats could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of up to 5 individuals would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 468.58 acres of modeled giant kangaroo rat habitat and permanently affect up to 1.92 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 2,659,073 acres of suitable habitat for the giant kangaroo rat throughout the species' range, of which 23079 acres (0.87 percent) occur within the study area. Therefore, project activities may affect up to 0.017 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of giant kangaroo rat by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of the giant kangaroo rat.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the giant kangaroo rat. Project activities would not increase the regional threats currently affecting the giant kangaroo rat as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Peninsular Bighorn Sheep</u>

We expect that adverse effects to Peninsular bighorn sheep could increased noise and vibration; and changes in topography. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Peninsular bighorn sheep are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the Peninsular bighorn sheep rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season), and due to the highly mobile nature of the species, individuals are likely to move away from project activities to engage in behaviors related to reproduction. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

We do not expect the proposed action to injure or kill individual Peninsular bighorn sheep; thus, we expect that the proposed action would not measurably reduce the numbers of Peninsular bighorn sheep locally or rangewide.

Distribution

Project activities could temporarily affect up to 40.12 acres of modeled Peninsular bighorn sheep habitat and permanently affect up to 0.17 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 734,521 acres of suitable habitat for the Peninsular bighorn sheep throughout the species' range, of which 2007 acres (0.273 percent) occur within the study area. Therefore, project activities may affect up to 0.005 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Peninsular bighorn sheep by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of the Peninsular bighorn sheep.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the Peninsular bighorn sheep. Project activities would not increase the regional threats currently affecting the Peninsular bighorn sheep as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Point Arena Mountain Beaver</u>

We expect that adverse effects to Point Arena mountain beaver could include increased erosion and sedimentation; increased noise and vibration; changes in topography; changes in dispersal, movement, or migration; and disturbance or removal of surface/subsurface refugia or hibernacula. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Point Arena mountain beavers are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the Point Arena mountain beaver rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

We do not expect the proposed action to injure or kill individual Point Arena mountain beavers; thus, we expect that the proposed action would not measurably reduce the numbers of Point Arena mountain beaver locally or rangewide.

Distribution

Project activities could temporarily affect up to 4.42 acres of modeled Point Arena mountain beaver habitat and permanently affect up to 0.02 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 33,128 acres of suitable habitat for the Point Arena mountain beaver throughout the species' range, of which 217 acres (0.66 percent) occur within the study area. Therefore, project activities may affect up to 0.013 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Point Arena mountain beaver by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of the Point Arena mountain beaver.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the Point Arena mountain beaver. Project activities would not increase the regional threats currently affecting the Point Arena mountain beaver as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Salt Marsh Harvest Mouse</u>

We expect that adverse effects to the salt marsh harvest mouse could include increased erosion and sedimentation; increased noise and vibration; changes in topography; changes in dispersal, movement, or migration; and disturbance or removal of surface/subsurface refugia or hibernacula. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where the salt marsh harvest mouse is present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the salt marsh harvest mouse rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

We do not expect the proposed action to injure or kill individual salt marsh harvest mice; thus, we expect that the proposed action would not measurably reduce the numbers of salt marsh harvest mouse locally or rangewide.

Distribution

Project activities could temporarily affect up to 110.78 acres of modeled salt marsh harvest mouse habitat and permanently affect up to 0.46 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 298,477 acres of suitable habitat for the salt marsh harvest mouse throughout the species' range, of which 5,419 acres (1.82 percent) occur within the study area. Therefore, project activities may affect up to 0.037 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of salt marsh harvest mouse by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of the salt marsh harvest mouse.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the salt marsh harvest mouse. Project activities would not increase the regional threats currently affecting the salt marsh harvest mouse as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>San Bernardino Merriam's Kangaroo Rat</u>

We expect that adverse effects to San Bernardino Merriam's kangaroo rat could include increased erosion and sedimentation; increased noise and vibration; changes in topography; changes in dispersal, movement, or migration; disturbance or removal of surface/subsurface refugia or hibernacula; vehicle strikes; and physical capture, collection, or handling. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where San Bernardino Merriam's kangaroo rat are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the San Bernardino Merriam's kangaroo rat rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of San Bernardino Merriam's kangaroo rat could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that project activities, including capture, may result in mortality or injury of up to 5 individuals, but such mortality or injury would be spread across multiple populations, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 335.79 acres of modeled San Bernardino Merriam's kangaroo rat habitat and permanently affect up to 1.39 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 926,802 acres of suitable habitat for the San Bernardino Merriam's kangaroo rat throughout the species' range, of which 16,444 acres (1.77 percent) occur within the study area. Therefore, project activities may affect up to 0.036 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of San Bernardino Merriam's kangaroo rat by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of the San Bernardino Merriam's kangaroo rat.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the San Bernardino Merriam's kangaroo rat. Project activities would not increase the regional threats currently affecting the San Bernardino Merriam's kangaroo rat as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Stephens' Kangaroo Rat</u>

We expect that adverse effects to Stephens' kangaroo rat could include increased erosion and sedimentation; increased noise and vibration; changes in topography; changes in dispersal, movement, or migration; disturbance or removal of surface/subsurface refugia or hibernacula; vehicle strikes; and physical capture, collection, or handling. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Stephens' kangaroo rat are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the Stephens' kangaroo rat rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of Stephens' kangaroo rat could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that project activities, including capture, may result in mortality or injury of up to 5 individuals, but such mortality or injury would be spread across multiple populations, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 107.59 acres of modeled Stephens' kangaroo rat habitat and permanently affect up to 0.45 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 272,853 acres of suitable habitat for the Stephens' kangaroo rat throughout the species' range, of which 5,346 acres (1.96 percent) occur within the study area. Therefore, project activities may affect up to 0.039 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Stephens' kangaroo rat by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of the Stephens' kangaroo rat.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the Stephens' kangaroo rat. Project activities would not increase the regional threats currently affecting the Stephens' kangaroo rat as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Tipton Kangaroo Rat</u>

We expect that adverse effects to Tipton kangaroo rat could include increased erosion and sedimentation; increased noise and vibration; changes in topography; changes in dispersal, movement, or migration; disturbance or removal of surface/subsurface refugia or hibernacula; vehicle strikes; and physical capture, collection, or handling. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Tipton kangaroo rat are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the Tipton kangaroo rat rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of Tipton kangaroo rat could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that project activities, including capture, may result in mortality or injury of up to 5 individuals, but such mortality or injury would be spread across multiple populations, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 208.07 acres of modeled Tipton kangaroo rat habitat and permanently affect up to 0.86 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 1,109,216 acres of suitable habitat for the Tipton kangaroo rat throughout the species' range, of which 10,359 acres (0.934 percent) occur within the study area. Therefore, project activities may affect up to 0.019 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Tipton kangaroo rat by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of the Tipton kangaroo rat.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the Tipton kangaroo rat. Project activities would not increase the regional threats currently affecting the Tipton kangaroo rat as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Effects to Critical Habitat</u>

We anticipate that project activities could result in adverse effects to covered mammal critical habitats, including:

- *Disturbance to soils or vegetation* – Project activities that disturb soils or vegetation could result in the physical loss of critical habitat or adverse effects to PBFs. Caltrans would avoid or minimize these effects by implementing conservation measures, including design measures to ensure that permanent facilities such as vaults and maintenance vehicle pullouts are not located in areas with PBFs, and that all temporary impacts to areas with PBFs are either avoided or, if avoidance is not possible, restored or mitigated for.

- *Introduction of invasive plants* – Project activities may introduce non-native plant species that alter the composition of critical habitats and adversely affect PBFs. For example, seeds of invasive plants may become lodged in construction vehicle tires from within or outside the action area, then be deposited into the action area during construction. In addition, ground disturbing activities, including those that remove vegetation or alter the substrate, may lead to increased colonization by invasive species. Caltrans will implement conservation measures to avoid or minimize the risk of introducing or spreading invasive plants,.

- *Changes in topography* – Project activities that involve excavation, including conduit and vault installation, could result in temporary changes in topography. Locations of vaults, maintenance vehicle pullouts, and network hubs would also require excavation and would result in minor, localized changes in topography. Temporary changes in topography could result in adverse effects to the PBFs of critical habitats. These consequences would be avoided and minimized by implementation of conservation measures which will avoid installation of permanent infrastructure (i.e., vaults, maintenance vehicle pullouts, and network hubs) in critical habitat, restore and recontour topography to original grade, and establish avoidance buffers around critical habitats. Implementing these measures will reduce the potential for adverse effects on critical habitats for covered mammals due to changes in topography.

Peninsular Bighorn Sheep Critical Habitat

We expect that adverse effects to Peninsular bighorn sheep critical habitat could include: disturbance to soils or vegetation; and introduction of invasive plants. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 12.73 acres temporarily and 0.05 acre permanently of critical habitat for the Peninsular bighorn sheep (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 0.16 percent of 377,419 total acres of the critical habitat for the Peninsular bighorn sheep. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Peninsular bighorn sheep critical habitat.

San Bernardino Merriam's Kangaroo Rat Critical Habitat

We expect that adverse effects to San Bernardino Merriam's kangaroo rat critical habitat could include: disturbance to soils or vegetation; and introduction of invasive plants. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 52.48 acres temporarily and 0.22 acre permanently of critical habitat for the San Bernardino Merriam's kangaroo rat (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 4.41 percent of 33,316 total acres of the critical habitat for the San Bernardino Merriam's kangaroo rat. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Peninsular bighorn sheep critical habitat.

Effects of the Action on Birds

Any covered birds or bird critical habitats that occur within the action area could be adversely affected by project activities. Caltrans would avoid or minimize effects to covered birds by implementing general and bird-specific conservation measures. Implementing these measures would establish seasonal work windows to avoid the species' peak breeding season, establish avoidance buffers around nests, complete preconstruction surveys, and monitor construction, among other measures. Here we describe potential adverse effects to covered birds and bird critical habitats. We further list relevant effects for each covered bird and bird critical habitat in their respective subheading.

Effects to Species

We anticipate that adverse effects to covered birds could include the following:

- *Increased noise and vibration* – Operation of heavy equipment could result in localized increases in noise and vibration. Increased noise and vibration could temporarily impair essential behaviors, including breeding, foraging, and sheltering, if individuals utilize sub-optimal habitats to avoid noisy areas. These effects would be limited to the construction phase and would be avoided and minimized by implementing conservation measures. These measures will limit construction activities to specific times of year and avoid covered bird species' sensitive life history periods (e.g., nesting and breeding season), and will establish avoidance buffers around suitable habitats and active nests. Implementation of these measures will reduce potential adverse effects of increased noise and vibration to covered birds.

- *Changes in visual features* – Operation of heavy equipment, placement of permanent structures, and the presence of construction personnel could change the visual characteristics of an area, potentially resulting in changes in behavior including nest abandonment. These effects would be avoided and minimized by implementation of general design and species-specific conservation measures that limit construction activities to specific times of year and avoid covered bird species' sensitive life history periods (e.g., nesting and breeding season) to the maximum extent practicable. Implementation of these measures would minimize adverse effects of increased visual disturbance to covered birds.

- *Disturbance or removal of vegetation* – All project activities could result in disturbance or removal of vegetation if not located on the roadway or other disturbed areas. Removing vegetation could reduce available habitat important for breeding, foraging, or sheltering. These effects would be minimized through implementation of conservation measures, including design measures, to avoid suitable habitat such as trees and other features that serve as potential nest locations.

- *Introduction of invasive plants* – Project activities may introduce non-native plant species that alter the composition of suitable species habitats. For example, seeds of invasive plants may become lodged in construction vehicle tires from within or outside the action area, then be deposited into the action area during construction. In addition, ground disturbing activities, including those that remove vegetation or alter the substrate, may lead to increased colonization by invasive species. Caltrans will implement conservation measures to avoid or minimize the risk of introducing or spreading invasive plants.

California Ridgway's Rail

We expect that adverse effects to California Ridgway's rail could include increased noise and vibration; introduction of invasive plants; and disturbance or removal of vegetation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where California Ridgway's rail are present. We do not expect these adverse effects to impair breeding activity because of the large distance of anticipated project activities from suitable breeding habitat (i.e., tidal marshes). Additionally, effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season) and Caltrans will work outside the breeding season whenever possible. When work outside the breeding season is not possible, Caltrans will establish exclusionary buffers around suitable habitat. Thus, we do not anticipate that the proposed action would meaningfully affect the species' reproductive capacity.

Numbers

We do not expect the proposed action to injure or kill individual California Ridgway's rails; thus, we expect that the proposed action would not measurably reduce the numbers of California Ridgway's rail locally or rangewide.

Distribution

Project activities could temporarily affect up to 43.64 acres of modeled California Ridgway's rail habitat and permanently affect up to 0.18 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 225,168 acres of suitable habitat for the California Ridgway's rail throughout the species' range, of which 2,138 acres (0.95 percent) occur within the study area. Therefore, project activities may affect up to 0.019 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of California Ridgway's rail by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of California Ridgway's rail.

Recovery

We do not anticipate that the proposed action would diminish the recovery potential of the California Ridgway's rail. Project activities would not increase the regional threats currently affecting the California Ridgway's rail as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

California Spotted Owl, Coastal Southern California DPS

We expect that adverse effects to California spotted owl could include increased noise and vibration; changes in visual features; introduction of invasive plants; and disturbance or removal of vegetation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where California spotted owl are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. Although we expect that project activities could reduce the productivity of up to 4 individual breeding pairs for one breeding season, we do not anticipate that this loss of productivity would meaningfully affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Caltrans will also work outside the breeding season whenever possible. When work outside the breeding season is not possible, Caltrans will survey for and completely avoid active nests by establishing an exclusionary buffer.

Numbers

We do not expect the proposed action to injure or kill individual California spotted owls. Caltrans proposes to work outside of the breeding season where possible, and to compensate for affected breeding pairs when work during the breeding season is unavoidable. This compensation would, at a minimum, maintain the current numbers of California spotted owl through restoration or enhancement of habitat; thus, we expect that the proposed action would not measurably reduce the numbers of California spotted owl locally or rangewide.

Distribution

Project activities could temporarily affect up to 174.79 acres of modeled California spotted owl habitat and permanently affect up to 0.72 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 1,022,416 acres of suitable habitat for the California spotted owl throughout the species' range, of which 8,656 acres (0.84 percent) occur within the study area. Therefore, project activities may affect up to 0.02 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of California spotted owl by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of California spotted owl.

Recovery

We do not anticipate that the proposed action would diminish the recovery potential of the California spotted owl. Project activities would not increase the regional threats currently affecting the California spotted owl as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

California Spotted Owl, Sierra Nevada DPS

We expect that adverse effects to California spotted owl could include increased noise and vibration; changes in visual features; introduction of invasive plants; and disturbance or removal of vegetation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where California spotted owl are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. Although we expect that project activities could reduce the productivity of up to 4 individual breeding pairs for one breeding season, we do not anticipate that this loss of productivity would meaningfully affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Caltrans will also work outside the breeding season whenever possible. When work outside the breeding season is not possible, Caltrans will survey for and completely avoid active nests by establishing an exclusionary buffer.

Numbers

We do not expect the proposed action to injure or kill individual California spotted owls. Caltrans proposes to work outside of the breeding season where possible, and to compensate for affected breeding pairs when work during the breeding season is unavoidable. This compensation would, at a minimum, maintain the current numbers of California spotted owl through restoration or enhancement of habitat; thus, we expect that the proposed action would not measurably reduce the numbers of California spotted owl locally or rangewide.

Distribution

Project activities could temporarily affect up to 1,148.09 acres of modeled California spotted owl habitat and permanently affect up to 4.75 acres, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 7,786,776 acres of suitable habitat for the California spotted owl throughout the species' range, of which 57,097 acres (0.73 percent) occur within the study area. Therefore, project activities may affect up to 0.01 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of California spotted owl by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of California spotted owl.

Recovery

We do not anticipate that the proposed action would diminish the recovery potential of the California spotted owl. Project activities would not increase the regional threats currently affecting the California spotted owl as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Coastal California Gnatcatcher</u>

We expect that adverse effects to coastal California gnatcatcher could include increased noise and vibration; changes in visual features; introduction of invasive plants; and disturbance or removal of vegetation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where coastal California gnatcatchers are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. Although we expect that project activities could reduce the productivity of up to 5 individual breeding pairs for one breeding season, we do not anticipate that this loss of productivity would meaningfully affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Caltrans will also work outside the breeding season whenever possible. When work outside the breeding season is not possible, Caltrans will survey for and completely avoid active nests by establishing an exclusionary buffer.

Numbers

We do not expect the proposed action to injure or kill individual coastal California gnatcatchers. Caltrans proposes to work outside of the breeding season where possible, and to compensate for affected breeding pairs when work during the breeding season is unavoidable. This compensation would, at a minimum, maintain the current numbers of coastal California gnatcatcher through restoration or enhancement of habitat; thus, we expect that the proposed action would not measurably reduce the numbers of coastal California gnatcatcher locally or rangewide.

Distribution

Project activities could temporarily affect up to 669.28 acres of modeled coastal California gnatcatcher habitat and permanently affect up to 2.77 acres, as described in Chapter 4 of the PBA

(Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 3,006,962 acres of suitable habitat for the coastal California gnatcatcher throughout the species' range, of which 33,024 acres (1.1 percent) occur within the study area. Therefore, project activities may affect up to 0.022 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of coastal California gnatcatcher by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of coastal California gnatcatcher.

Recovery

We do not anticipate that the proposed action would diminish the recovery potential of the coastal California gnatcatcher. Project activities would not increase the regional threats currently affecting the coastal California gnatcatcher as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

Least Bell's Vireo

We expect that adverse effects to least Bell's vireo could include increased noise and vibration; changes in visual features; introduction of invasive plants; and disturbance or removal of vegetation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where least Bell's vireos are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. Although we expect that project activities could reduce the productivity of up to 5 individual breeding pairs for one breeding season, we do not anticipate that this loss of productivity would meaningfully affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Caltrans will also work outside the breeding season whenever possible. When work outside the breeding season is not possible, Caltrans will survey for and completely avoid active nests by establishing an exclusionary buffer.

Numbers

We do not expect the proposed action to injure or kill individual least Bell's vireos. Caltrans proposes to work outside of the breeding season where possible, and to compensate for affected breeding pairs when work during the breeding season is unavoidable. This compensation would, at a minimum, maintain the current numbers of least Bell's vireo through restoration or enhancement of habitat; thus, we expect that the proposed action would not measurably reduce the numbers of least Bell's vireo locally or rangewide.

Distribution

Project activities could temporarily affect up to 78.97 acres of modeled least Bell's vireo habitat and permanently affect up to 0.33 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 120,190 acres of suitable habitat for the least Bell's vireo throughout the species' range, of which 3,346 acres (2.78 percent) occur within the study area. Therefore, project activities may affect up to 0.066 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of least Bell's vireo by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of least Bell's vireo.

Recovery

We do not anticipate that the proposed action would diminish the recovery potential of the least Bell's vireo. Project activities would not increase the regional threats currently affecting the least Bell's vireo as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Northern Spotted Owl</u>

We expect that adverse effects to northern spotted owl could include increased noise and vibration; changes in visual features; introduction of invasive plants; and disturbance or removal of vegetation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where northern spotted owls are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. Although we expect that project activities could reduce the productivity of up to 5 individual breeding pairs for one breeding season, we do not anticipate that this loss of productivity would meaningfully affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Caltrans will also work outside the breeding season whenever possible. When work outside the breeding season is not possible, Caltrans will survey for and completely avoid active nests by establishing an exclusionary buffer.

Numbers

We do not expect the proposed action to injure or kill individual northern spotted owls. Caltrans proposes to work outside of the breeding season where possible, and to compensate for affected breeding pairs when work during the breeding season is unavoidable. This compensation would, at a minimum, maintain the current numbers of northern spotted owl through restoration or enhancement of habitat; thus, we expect that the proposed action would not measurably reduce the numbers of northern spotted owl locally or rangewide.

Distribution

Project activities could temporarily affect up to 1,259.96 acres of modeled northern spotted owl habitat and permanently affect up to 5.22 acres, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 9,177,646 acres of suitable habitat for the northern spotted owl throughout the species' range, of which 63,231 acres (0.69 percent) occur within the study area. Therefore, project activities may affect up to 0.014 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of northern spotted owl by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of northern spotted owl.

Recovery

We do not anticipate that the proposed action would diminish the recovery potential of the northern spotted owl. Project activities would not increase the regional threats currently affecting the northern spotted owl as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

Southwestern Willow Flycatcher

We expect that adverse effects to southwestern willow flycatcher could include increased noise and vibration; changes in visual features; introduction of invasive plants; and disturbance or removal of vegetation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where southwestern willow flycatchers are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. Although we expect that project activities could reduce the productivity of up to 4 individual breeding pairs for one breeding season, we do not anticipate that this loss of productivity would meaningfully affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Caltrans will also work outside the breeding season whenever possible. When work outside the breeding season is not possible, Caltrans will survey for and completely avoid active nests by establishing an exclusionary buffer.

Numbers

We do not expect the proposed action to injure or kill individual southwestern willow flycatchers. Caltrans proposes to work outside of the breeding season where possible, and to compensate for affected breeding pairs when work during the breeding season is unavoidable. This compensation would, at a minimum, maintain the current numbers of southwestern willow flycatcher through restoration or enhancement of habitat; thus, we expect that the proposed action would not measurably reduce the numbers of southwestern willow flycatcher locally or rangewide.

Distribution

Project activities could temporarily affect up to 144.95 acres of modeled southwestern willow flycatcher habitat and permanently affect up to 0.60 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 255,730 acres of suitable habitat for the southwestern willow flycatcher throughout the species' range, of which 7,191 acres (2.81 percent) occur within the study area.

Therefore, project activities may affect up to 0.057 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of southwestern willow flycatcher by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of southwestern willow flycatcher.

Recovery

We do not anticipate that the proposed action would diminish the recovery potential of the southwestern willow flycatcher. Project activities would not increase the regional threats currently affecting the southwestern willow flycatcher as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Yuma Ridgway's Rail</u>

We expect that adverse effects to Yuma Ridgway's rail could include increased noise and vibration; introduction of invasive plants; and disturbance or removal of vegetation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Yuma Ridgway's rail are present. We do not expect these adverse effects to impair breeding activity because of the large distance of anticipated project activities from suitable breeding habitat (i.e., tidal marshes). Additionally, effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season) and Caltrans will work outside the breeding season whenever possible. When work outside the breeding season is not possible, Caltrans will establish exclusionary buffers around suitable habitat. Thus, we do not anticipate that the proposed action would meaningfully affect the species' reproductive capacity.

Numbers

We do not expect the proposed action to injure or kill individual Yuma Ridgway's rail; thus, we expect that the proposed action would not measurably reduce the numbers of Yuma Ridgway's rail locally or rangewide.

Distribution

Project activities could temporarily affect up to 43.64 acres of modeled Yuma Ridgway's rail habitat and permanently affect up to 0.18 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 264,010 acres of suitable habitat for the Yuma Ridgway's rail throughout the species' range, of which 232 acres (0.088 percent) occur within the study area. Therefore, project activities may affect up to 0.002 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Yuma Ridgway's rail by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Yuma Ridgway's rail.

Recovery

We do not anticipate that the proposed action would diminish the recovery potential of the Yuma Ridgway's rail. Project activities would not increase the regional threats currently affecting the Yuma Ridgway's rail as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Effects to Critical Habitats</u>

We anticipate that project activities could result in adverse effects to covered bird critical habitats, including:

- *Disturbance to soils or vegetation* – Project activities that disturb soils or vegetation could result in the physical loss of critical habitat or adverse effects to PBFs. Caltrans would avoid or minimize these effects by implementing conservation measures, including design measures to ensure that permanent facilities such as vaults and maintenance vehicle pullouts are not located in areas with PBFs, and that all temporary impacts to areas with PBFs are either avoided or, if avoidance is not possible, restored or mitigated for.

- *Introduction of invasive plants* – Project activities may introduce non-native plant species that alter the composition of critical habitats and adversely affect PBFs. For example, seeds of invasive plants may become lodged in construction vehicle tires from within or outside the action area, then be deposited into the action area during construction. In addition, ground disturbing activities, including those that remove vegetation or alter the substrate, may lead to increased colonization by invasive species. Caltrans will implement conservation measures to avoid or minimize the risk of introducing or spreading invasive plants.

Coastal California Gnatcatcher Critical Habitat

We expect that adverse effects to coastal California gnatcatcher critical habitat could include: disturbance to soils or vegetation; and introduction of invasive plants. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 116.43 acres temporarily and 0.48 acre permanently of critical habitat for the coastal California gnatcatcher (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 0.06 percent of 197,409 total acres of the critical habitat for coastal California gnatcatcher. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of coastal California gnatcatcher critical habitat.

Least Bell's Vireo Critical Habitat

We expect that adverse effects to least Bell's vireo critical habitat could include: disturbance to soils or vegetation; and introduction of invasive plants. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 58.16 acres temporarily and 0.24 acre permanently of critical habitat for the least Bell's vireo (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 3.68 percent of 36,988 total acres of the critical habitat for least Bell's vireo. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of least Bell's vireo critical habitat.

Northern Spotted Owl Critical Habitat

We expect that adverse effects to northern spotted owl critical habitat could include: disturbance to soils or vegetation; and introduction of invasive plants. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 196.06 acres temporarily and 0.81 acre permanently of critical habitat for the northern spotted owl (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 0.01 percent of 2,101,785 total acres of the critical habitat for northern spotted owl. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of northern spotted owl critical habitat.

Southwestern Willow Flycatcher Critical Habitat

We expect that adverse effects to southwestern willow flycatcher critical habitat could include: disturbance to soils or vegetation; and introduction of invasive plants. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 71.33 acres temporarily and 0.30 acre permanently of critical habitat for the southwestern willow flycatcher (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 2.69 percent of 39,188 total acres of the critical habitat for southwestern willow flycatcher. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of southwestern willow flycatcher critical habitat.

Effects of the Action on Reptiles

Any covered reptiles that occur within the action area could be adversely affected by project activities. Caltrans would avoid or minimize effects to covered reptiles by implementing general and reptile-specific conservation measures. Implementing these measures would establish seasonal work windows to avoid the species' peak breeding season, establish avoidance buffers around burrows, complete preconstruction surveys, and monitor construction, among other measures. Here we describe potential adverse effects to covered reptiles and reptile critical habitats. We further list relevant effects for each covered reptile and reptile critical habitat in their respective subheading.

<u>Effects to Species</u>

We anticipate that adverse effects to covered reptiles could include the following:

- *Increased erosion and sedimentation* – Project activities that involve removal of vegetation and disturbance of soils, like trenching or plowing, could result in increased erosion and sedimentation. This could cause adverse effects such as degradation of suitable habitat, and potentially bury or entrap covered reptiles, particularly individuals of a fossorial species. These effects would be limited to the construction phase and would be minimized by implementation of conservation measures which will reduce project activities during rain events, as well as establish work windows and activity buffers around burrows and other sensitive habitats. Implementing these measures will reduce the potential for adverse effects on covered reptiles due to erosion and sedimentation.

- *Increased noise and vibration* – Operation of heavy equipment could result in localized increases in noise and vibration. Increased noise and vibration could temporarily impair essential behaviors, including breeding, foraging, and sheltering, if individuals utilize sub-optimal habitats to avoid noisy areas. These effects would be limited to the construction phase and would be avoided and minimized by implementation of conservation measures. These measures will limit construction activities to specific times of year and avoid covered reptile species' sensitive life history events (e.g., breeding season), complete surveys to identify any occupied areas, and establish avoidance buffers around suitable habitats and other micro habitat features such as burrows. Implementing these measures will reduce the potential for adverse effects on covered amphibians due to increased noise and vibration.

- *Changes in topography* – Project activities that involve excavation, including conduit and vault installation, could result in temporary changes in topography. Locations of vaults, maintenance vehicle pullouts, and network hubs would also require excavation and would result in minor, localized changes in topography. Temporary changes in topography could result in the entrapment of covered reptiles and confine individuals to excavated areas with no escape, which may expose individuals to predation, increase stress, and impair essential behaviors. These consequences would be avoided and minimized by implementation of conservation measures which will avoid installation of permanent infrastructure (i.e., vaults, maintenance vehicle pullouts, and network hubs) in suitable habitat, restore and recontour topography to original grade, prevent species entrapment, and establish avoidance buffers around suitable habitats and active burrows. Implementing these measures will reduce the potential for adverse effects on covered amphibians due to changes in topography.

- *Disturbance or removal of surface/subsurface refugia or hibernacula* – Project activities that involve excavation, ground disturbance, or vegetation removal could disturb or remove refugia or hibernacula used by covered reptiles, which could impair essential sheltering behavior. This could include destruction of subsurface burrows or the removal of features such as woody debris and leaf litter. These effects will be minimized through implementation of conservation measures, including design measures, which will ensure that suitable habitat is avoided and that temporarily disturbed areas are revegetated. Implementing these measures will reduce the potential for adverse effects on covered reptiles due to disturbance or removal of surface/subsurface refugia or hibernacula.

- *Vehicle strikes* – Vehicles or construction equipment could contact or crush covered reptiles, leading to injury or death. Species that are slow moving or immobile (e.g., reptiles) are more susceptible to these impacts as they may not be able to escape or perceive the vehicle in time. Vehicle strikes will be minimized by implementing conservation measures that avoid suitable habitat and known populations, as well as implement BMPs such as preconstruction surveys, daily clearance surveys, and vehicle speed limits.

- *Physical capture, collection, or handling* –Relocation during construction activities would result in the capture and handling of individual covered reptiles. Capturing and handling individuals that would otherwise be subject to more severe adverse effects may result in injury or mortality, but we anticipate that rates of injury or mortality would be much lower than if Caltrans did not attempt to relocate covered reptiles at risk of more severe effects. Implementation of a relocation plan would minimize the adverse effects to covered reptiles resulting from physical capture, collection, or handling.

<u>Alameda Whipsnake</u>

We expect that adverse effects to Alameda whipsnake could include increased erosion and sedimentation; increased noise and vibration; changes in topography; disturbance or removal of surface/subsurface refugia or hibernacula; vehicle strikes; and physical capture, collection, or handling. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Alameda whipsnakes are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the Alameda whipsnake rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). The decreased breeding success of the limited number of Alameda whipsnakes exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of Alameda whipsnakes could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of up to 5 individuals would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 84.08 acres of modeled Alameda whipsnake habitat and permanently affect up to 0.35 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 656,065 acres of suitable habitat for the Alameda whipsnake throughout the species' range, of which 4,102 acres (0.63 percent) occur within the study area. Therefore, project activities may affect up to 0.013 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Alameda whipsnake by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Alameda whipsnake.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the Alameda whipsnake. Project activities would not increase the regional threats currently affecting the Alameda whipsnake as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Blunt-nosed Leopard Lizard</u>

We expect that adverse effects to blunt-nosed leopard lizard could include increased erosion and sedimentation; increased noise and vibration; changes in topography; and disturbance or removal of surface/subsurface refugia or hibernacula. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where blunt-nosed leopard lizards are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the blunt-nosed leopard lizard rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). The decreased breeding success of the limited number of blunt-nosed leopard lizard exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

We do not expect the proposed action to injure or kill individual blunt-nosed leopard lizards; thus, we expect that the proposed action would not measurably reduce the numbers of blunt-nosed leopard lizard locally or rangewide.

Distribution

Project activities could temporarily affect up to 99.78 acres of modeled blunt-nosed leopard lizard habitat and permanently affect up to 0.41 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 357,076 acres of suitable habitat for the blunt-nosed leopard lizard throughout the species' range, of which 4,967 acres (1.39 percent) occur within the study area. Therefore, project activities may affect up to 0.028 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of blunt-nosed leopard lizard by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of the blunt-nosed leopard lizard.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the blunt-nosed leopard lizard. Project activities would not increase the regional threats currently affecting the blunt-nosed leopard lizard as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

Coachella Valley Fringe-toed Lizard

We expect that adverse effects to Coachella Valley fringe-toed lizard could include increased erosion and sedimentation; increased noise and vibration; changes in topography; disturbance or removal of surface/subsurface refugia or hibernacula; vehicle strikes; and physical capture, collection, or handling. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Coachella Valley fringe-toed lizards are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the Coachella Valley fringe-toed lizard rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). The decreased breeding success of the limited number of Coachella Valley fringe-toed lizards exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of Coachella Valley fringe-toed lizard could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of up to 5 individuals would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 55.53 acres of modeled Coachella Valley fringe-toed lizard habitat and permanently affect up to 0.23 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 205,087 acres of suitable habitat for the Coachella Valley fringe-toed lizard throughout the species' range, of which 2,767 acres (1.349 percent) occur within the study area. Therefore, project activities may affect up to 0.027 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Coachella Valley fringe-toed lizard by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of the Coachella Valley fringe-toed lizard.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the Coachella Valley fringe-toed lizard. Project activities would not increase the regional threats currently affecting the Coachella Valley fringe-toed lizard as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Giant Garter Snake</u>

We expect that adverse effects to giant garter snake could include increased erosion and sedimentation; increased noise and vibration; changes in topography; disturbance or removal of surface/subsurface refugia or hibernacula; vehicle strikes; and physical capture, collection, or handling. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where giant garter snakes are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the giant garter snake rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). The decreased breeding success of the limited number of giant garter snakes exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of giant garter snakes could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of up to 5 individuals would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 279.63 acres of modeled giant garter snake habitat and permanently affect up to 1.16 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 1,145,413 acres of suitable habitat for the giant garter snake throughout the species' range, of which 13,895 acres (1.21 percent) occur within the study area. Therefore, project activities may affect up to 0.024 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of giant garter snake by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of the giant garter snake.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the giant garter snake. Project activities would not increase the regional threats currently affecting the giant garter snake as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Northwestern Pond Turtle</u>

We expect that adverse effects to northwestern pond turtle could include increased erosion and sedimentation; increased noise and vibration; changes in topography; and disturbance or removal of surface/subsurface refugia or hibernacula. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where northwestern pond turtles are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the northwestern pond turtle rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). The decreased breeding success of the limited number of northwestern pond turtles exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of northwestern pond turtle could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of up to 30 individuals would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 6,079 acres of modeled northwestern pond turtle habitat and permanently affect up to 25.17 acres, as described in Chapter 4 of the PBA (Caltrans 2024). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 32,284,764 acres of suitable habitat for the northwestern pond turtle throughout the species' range, of which 702,264 acres (0.92 percent) occur within the study area. Therefore, project activities may affect up to 0.019 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of northwestern pond turtle by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of the northwestern pond turtle.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the northwestern pond turtle. Project activities would not increase the regional threats currently affecting the northwestern pond turtle as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>San Francisco Garter Snake</u>

We expect that adverse effects to San Francisco garter snake could include increased erosion and sedimentation; increased noise and vibration; changes in topography; and disturbance or removal of surface/subsurface refugia or hibernacula. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where San Francisco garter snakes are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the San Francisco garter snake rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). The decreased breeding success of the limited number of San Francisco garter snakes exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

We do not expect the proposed action to injure or kill individual San Francisco garter snakes; thus, we expect that the proposed action would not measurably reduce the numbers of San Francisco garter snake locally or rangewide.

Distribution

Project activities could temporarily affect up to 3.25 acres of modeled San Francisco garter snake habitat and permanently affect up to 0.01 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 5,886 acres of suitable habitat for the San Francisco garter snake throughout the species' range, of which 160 acres (2.722 percent) occur within the study area. Therefore, project activities may affect up to 0.055 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of SanSan Francisco garter snake by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of the SanSan Francisco garter snake.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the San Francisco garter snake. Project activities would not increase the regional threats currently affecting the San Francisco garter snake as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Southwestern Pond Turtle</u>

We expect that adverse effects to southwestern pond turtle could include increased erosion and sedimentation; increased noise and vibration; changes in topography; and disturbance or removal of surface/subsurface refugia or hibernacula. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where southwestern pond turtles are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the southwestern pond turtle rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). The decreased breeding success of the limited number of southwestern pond turtles exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of southwestern pond turtle could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of up to 10 individuals would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 1,674 acres of modeled southwestern pond turtle habitat and permanently affect up to 6.94 acres, as described in Chapter 4 of the PBA (Caltrans 2024). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 7,215,093 acres of suitable habitat for the southwestern pond turtle throughout the species' range, of which 83,103 acres (1.15 percent) occur within the study area. Therefore, project activities may affect up to 0.023 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of southwestern pond turtle by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of the southwestern pond turtle.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the southwestern pond turtle. Project activities would not increase the regional threats currently affecting the southwestern pond turtle as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Effects to Critical Habitat</u>

We anticipate that project activities could result in adverse effects to covered reptile critical habitats, including:

- *Disturbance to soils or vegetation* – Project activities that disturb soils or vegetation could result in the physical loss of critical habitat or adverse effects to PBFs if those habitats or PBFs are present. Caltrans would avoid or minimize these effects by implementing conservation measures, including design measures to ensure that permanent facilities such as vaults and maintenance vehicle pullouts are not located in areas with PBFs, and that all temporary impacts to areas with PBFs are either avoided or, if avoidance is not possible, restored or mitigated for.

- *Introduction of invasive plants* – Project activities may introduce non-native plant species that alter the composition of critical habitats and adversely affect PBFs. For example, seeds of invasive plants may become lodged in construction vehicle tires from within or outside the action area, then be deposited into the action area during construction. In addition, ground disturbing activities, including those that remove vegetation or alter the substrate, may lead to increased colonization by invasive species. Caltrans will implement conservation measures to avoid or minimize the risk of introducing or spreading invasive plants.

- *Disturbance or removal of surface/subsurface refugia or hibernacula* – Project activities that involve excavation, ground disturbance, or vegetation removal could disturb or remove refugia that contribute to PBFs for breeding or sheltering. This could include destruction of subsurface burrows or the removal of features such as woody debris and leaf litter in reptile critical habitats. Caltrans will minimize these effects with conservation measures, including design measures, which will ensure that refugia and hibernacula are avoided and that temporarily disturbed areas are revegetated. Implementing these measures will reduce potential adverse effects to PBFs that rely on the presence of surface/subsurface refugia or hibernacula.

Alameda Whipsnake Critical Habitat

We expect that adverse effects to Alameda whipsnake critical habitat could include: disturbance to soils or vegetation; introduction of invasive plants; and disturbance or removal of surface/subsurface refugia or hibernacula. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could temporarily affect up to 11.93 acres of critical habitat for the Alameda whipsnake, and permanently affect up to 0.05 acre. The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents 0.14 percent of 156,283 total acres of the critical habitat for Alameda whipsnake. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Alameda whipsnake critical habitat.

Effects of the Action on Amphibians

Any covered amphibians that occur within the action area could be adversely affected by project activities. Caltrans would avoid or minimize effects to covered amphibians by implementing general and amphibian-specific conservation measures. Implementing these measures would establish seasonal work windows to avoid the species' sensitive habitats and breeding seasons, establish habitat avoidance and minimization buffers, complete preconstruction surveys, limit construction in the rain, and monitor construction, among other measures. Here we describe potential adverse effects to covered amphibians and amphibian critical habitats. We further list relevant effects for each covered amphibian and amphibian critical habitat in their respective subheading.

Effects to Species

We anticipate that adverse effects to covered amphibian species could include the following:

- *Increased erosion and sedimentation, including turbidity* – Project activities that involve removal of vegetation and disturbance of soils, like trenching or plowing, could result in increased erosion and sedimentation, including turbidity. This could cause adverse effects such as degradation of suitable habitat, potentially bury or entrap covered amphibians, or (in the case of increased turbidity) smother eggs. These effects would be limited to the construction phase and would be minimized by implementation of conservation measures which will reduce project activities during rain events and implement standard stormwater BMPs, as well as establish work windows and activity buffers. Additionally, Caltrans will prohibit work within a 250-foot buffer around suitable aquatic habitats. Implementing these measures will reduce the potential for adverse effects on covered amphibians due to erosion and sedimentation.

- *Increased noise and vibration* – Operation of heavy equipment could result in localized increases in noise and vibration. Increased noise and vibration could temporarily impair essential behaviors, including breeding, foraging, and sheltering, if individuals utilize sub-optimal habitats to avoid noisy areas. These effects would be limited to the construction phase and would be avoided and minimized by implementation of conservation measures. These measures will limit construction activities to specific times of year and avoid covered amphibian species' sensitive life history events (e.g., breeding season), complete surveys to identify any occupied areas, and establish avoidance buffers around suitable habitats and other micro habitat features (such as vernal pools, sandy soils, or open dry lupine areas with rodent burrows). Implementing these measures will reduce the potential for adverse effects on covered amphibians due to increased noise and vibration.

- *Changes in topography* – Project activities that involve excavation, including conduit and vault installation, could result in temporary changes in topography. Locations of vaults, maintenance vehicle pullouts, and network hubs would also require excavation and would result in minor, localized changes in topography. Temporary changes in topography could result in the entrapment of covered amphibians and confine individuals to excavated areas with no escape, which may expose individuals to predation, increase stress, and impair essential behaviors. These consequences would be avoided and minimized by implementation of conservation measures which will avoid installation of permanent infrastructure (i.e., vaults, maintenance vehicle pullouts, and network hubs) in suitable habitat, restore and recontour topography to original grade, prevent species entrapment, and establish avoidance buffers around suitable habitats. Implementing these measures will reduce the potential for adverse effects on covered amphibians due to changes in topography.

- *Introduction of hazardous materials* – Operation of heavy equipment and the associated refueling and maintenance needs would require the use of potential contaminants that, if released into the environment could result in adverse effects to covered amphibians.

Exposure to contaminants could cause both acute and longer-term food-web based responses within the project footprint and may in some instances extend beyond the footprint. Direct exposure to hazardous materials could also result in injury or death to individuals through acute toxicity. These consequences would be limited to the construction phase and will be minimized with conservation measures to minimize the risk of introducing hazardous materials during project activities. Other, amphibian-specific conservation measures will require construction activities to occur outside of the species sensitive period, avoid work in species habitat during the rainy season, and prohibit work within a 250-foot buffer around suitable aquatic habitats. Additional measures require the development and implementation of a plan for prompt and effective response to any accidental spills, and limit refueling and maintenance of heavy equipment within 150 feet of aquatic habitat. Implementing these measures will reduce the potential for adverse effects on covered amphibians due to the introduction of hazardous materials.

- *Changes in air quality* – Project activities that involve the operation of heavy equipment, removal of vegetation, and other ground disturbing activities, like trenching or plowing, could result in changes in air quality. This could result in the degradation of suitable habitat and could impair essential behaviors, including foraging and breeding. These effects would be limited to the construction phase and would be avoided and minimized by implementation of seasonal work windows, which limits construction activities to specific times of year and avoids covered amphibians' sensitive life history events (e.g., breeding season), plus other design measures. Implementing these measures will reduce the potential for adverse effects on covered amphibians due to changes in air quality.

- *Introduction of invasive competitors or disease* – Project activities may introduce invasive animals or disease to work areas through contamination of equipment, vehicles, personnel, or materials such as soils used for backfilling. Potential effects to covered amphibians by an invasive competitor or disease vary widely depending on the invasive species or disease, but competition or disease can cause stress to individuals, which can ultimately impair essential behaviors, such as breeding, foraging, and sheltering. In other instances, the introduction of a predator (e.g., bullfrogs) could result in increased predation. Handling amphibians can also introduce disease when implementing conservation measures to capture and relocate individuals. These effects will be minimized by implementing conservation measures that require construction activities to occur outside of sensitive habitats; minimize and restore impacts near covered amphibian populations; implement BMPs to limit the introduction of invasive species on equipment, vehicles, personnel, and materials as well as ensure good site keeping; and implement approved protocols for safely handling and relocating amphibians to avoid disease transmission and spread. Together, these measures will reduce the potential adverse effects to covered amphibians by minimizing the introduction of invasive competitors and disease.

- *Introduction of invasive plants* – Project activities may introduce non-native plant species that alter the composition of suitable species habitats. For example, seeds of invasive plants may become lodged in construction vehicle tires from within or outside the action area, then be deposited into the action area during construction. In addition, ground disturbing activities, including those that remove vegetation or alter the substrate, may lead to increased colonization by invasive species. Caltrans will implement conservation measures to avoid or minimize the risk of introducing or spreading invasive plants.

- *Changes in hydrology* – Project activities that involve excavation could cause changes in the hydrology of nearby aquatic habitats. Excavation would not occur within aquatic habitats; however, excavation may occur in adjacent uplands. In these instances, excavation could result in minor, localized changes in hydrology. Changes in hydrology could adversely affect covered amphibians by modifying suitable aquatic habitats, for example by altering inundation duration, or causing minor changes in flows. We expect that these changes would be most pronounced in seasonal aquatic habitats where they may expose individuals to increased predation or stress, and impair essential behaviors such as breeding, foraging, or sheltering. These effects will be minimized by implementing conservation measures to avoid installing permanent infrastructure (i.e., vaults, and network hubs) in suitable habitat, restore and recontour topography to original grade, and establish avoidance buffers around suitable habitats.

- *Disturbance or removal of surface/subsurface refugia* – Project activities that involve excavation, ground disturbance, or vegetation removal could disturb or remove refugia used by covered amphibians, which could impair essential sheltering behavior. This could include destruction of subsurface burrows or the removal of features such as woody debris and leaf litter. These effects will be minimized through implementation of conservation measures, including design measures, which will ensure that suitable habitat is avoided and that temporarily disturbed areas are revegetated. Implementing these measures will reduce the potential for adverse effects on covered amphibians due to disturbance or removal of surface/subsurface refugia.

- *Vehicle strikes* – Vehicles or construction equipment could contact or crush covered amphibians, leading to injury or death. Species that are slow moving or immobile are more susceptible to these impacts as they may not be able to escape or perceive the vehicle in time. Vehicle strikes will be minimized by implementing conservation measures that avoid suitable habitat and known populations, as well as implement BMPs such as preconstruction surveys, daily clearance surveys, and vehicle speed limits.

- *Physical capture, collection, or handling* – Implementation of relocation efforts during construction activities would result in the capture and handling of individual covered amphibians. Capturing and handling individuals that would otherwise be subject to more severe adverse effects may result in injury or mortality, but we anticipate that rates of injury or mortality would be much lower than if Caltrans did not attempt to relocate covered amphibians at risk of more severe effects. Implementation of a relocation plan would minimize the adverse effects to covered amphibians resulting from physical capture, collection, or handling.

Arroyo Toad

We expect that adverse effects to arroyo toad could include increased noise and vibration; changes in topography; introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; introduction of invasive plants; changes in hydrology; disturbance or removal of surface/subsurface refugia; vehicle strikes; and physical capture, collection, or handling. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where arroyo toads are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the arroyo toad rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Caltrans will also completely avoid direct impacts (i.e., ground disturbance) to aquatic features where the species breeds. The decreased breeding success of the limited number of arroyo toads exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of arroyo toads could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of up to 10 individuals would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 219.6 acres of modeled arroyo toad habitat and permanently affect up to 0.91 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 1,285,756 acres of suitable habitat for the arroyo toad throughout the species' range, of which 10,891 acres (0.85 percent) occur within the study area. Therefore, project activities may affect up to 0.017 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of arroyo toad by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of arroyo toad.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the arroyo toad. Project activities would not increase the regional threats currently affecting the arroyo toad as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

California Red-legged Frog

We expect that adverse effects to California red-legged frog could include increased noise and vibration; changes in topography; introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; introduction of invasive plants; changes in hydrology; disturbance or removal of surface/subsurface refugia; vehicle strikes; and physical capture, collection, or handling. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where California red-legged frogs are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the California red-legged frog rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Caltrans will also completely avoid direct impacts (i.e., ground disturbance) to aquatic features where the species breeds. The decreased breeding success of the limited number of California red-legged frogs exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of California red-legged frog could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of up to 15 individuals would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 2,903.63 acres of modeled California red-legged frog habitat and permanently affect up to 12.02 acres, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 14,024,887 acres of suitable habitat for the California red-legged frog throughout the species' range, of which 143,650 acres (1.02 percent) occur within the study area. Therefore, project activities may affect up to 0.021 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of California red-legged frog by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of California red-legged frog.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the California red-legged frog. Project activities would not increase the regional threats currently affecting the California red-legged frog as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>California Tiger Salamander, Central California DPS</u>

We expect that adverse effects to California tiger salamander could include increased noise and vibration; changes in topography; introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; introduction of invasive plants; changes in hydrology; disturbance or removal of surface/subsurface refugia; vehicle strikes; and physical capture, collection, or handling. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where California tiger salamanders are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the California tiger salamander rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Caltrans will also limit direct impacts (i.e., ground disturbance) within 250 feet of aquatic features where the species may be present to 25 acres. The decreased breeding success of the limited number of California tiger salamanders exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of California tiger salamander could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of up to 15 individuals would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 1,161.01 acres of modeled California tiger salamander habitat and permanently affect up to 4.81 acres, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 6,430,201 acres of suitable habitat for the California tiger salamander throughout the species' range, of which 57,607 acres (0.90 percent) occur within the study area. Therefore, project activities may affect up to 0.018 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of California tiger salamander by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of California tiger salamander.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the California tiger salamander. Project activities would not increase the regional threats currently affecting the California tiger salamander as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>California Tiger Salamander, Santa Barbara County DPS</u>

We expect that adverse effects to California tiger salamander could include increased noise and vibration; changes in topography; introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; introduction of invasive plants; changes in hydrology; disturbance or removal of surface/subsurface refugia; vehicle strikes; and physical capture, collection, or handling. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where California tiger salamanders are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the California tiger salamander rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Caltrans will also limit direct impacts (i.e., ground disturbance) within 250 feet of aquatic features where the species may be present to 1 acre. The decreased breeding success of the limited number of California tiger salamanders exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of California tiger salamander could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of up to 5 individuals would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 41.51 acres of modeled California tiger salamander habitat and permanently affect up to 0.17 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 126,088 acres of suitable habitat for the California tiger salamander throughout the species' range, of which 2,059 acres (1.63 percent) occur within the study area. Therefore, project activities may affect up to 0.033 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of California tiger salamander by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of California tiger salamander.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the California tiger salamander. Project activities would not increase the regional threats currently affecting the California tiger salamander as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>California Tiger Salamander, Sonoma DPS</u>

We expect that adverse effects to California tiger salamander could include increased noise and vibration; changes in topography; introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; introduction of invasive plants; changes in hydrology; disturbance or removal of surface/subsurface refugia; vehicle strikes; and physical capture, collection, or handling. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where California tiger salamanders are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the California tiger salamander rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Caltrans will also limit direct impacts (i.e., ground disturbance) within 250 feet of aquatic features where the species may be present to 1 acre. The decreased breeding success of the limited number of California tiger salamanders exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of California tiger salamander could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of up to 5 individuals would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 24.97 acres of modeled California tiger salamander habitat and permanently affect up to 0.1 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 80,686 acres of suitable habitat for the California tiger salamander throughout the species' range, of which 1,244 acres (1.54 percent) occur within the study area. Therefore, project activities may affect up to 0.031 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of California tiger salamander by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of California tiger salamander.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the California tiger salamander. Project activities would not increase the regional threats currently affecting the California tiger salamander as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

Kern Canyon Slender Salamander

We expect that adverse effects to Kern Canyon slender salamander could include increased noise and vibration; changes in topography; introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; introduction of invasive plants; changes in hydrology; disturbance or removal of surface/subsurface refugia; vehicle strikes; and physical capture, collection, or handling. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Kern Canyon slender salamander are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the Kern Canyon slender salamander rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Caltrans will also completely avoid direct impacts (i.e., ground disturbance) to aquatic features where the species breeds. The decreased breeding success of the limited number of Kern Canyon slender salamander exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of Kern Canyon slender salamanders could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of up to 5 individuals would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 15.34 acres of modeled Kern Canyon slender salamander habitat and permanently affect up to 0.06 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 37,514 acres of suitable habitat for the Kern Canyon slender salamander throughout the species' range, of which 766 acres (2.04 percent) occur within the study area. Therefore, project activities may affect up to 0.041 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Kern Canyon slender salamander by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Kern Canyon slender salamander.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the Kern Canyon slender salamander. Project activities would not increase the regional threats currently affecting the Kern Canyon slender salamander as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

Relictual Slender Salamander

We expect that adverse effects to relictual slender salamander could include increased noise and vibration; changes in topography; introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; introduction of invasive plants; changes in hydrology; disturbance or removal of surface/subsurface refugia; vehicle strikes; and physical capture, collection, or handling. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where relictual slender salamanders are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the relictual slender salamander rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Caltrans will also completely avoid direct impacts (i.e., ground disturbance) to aquatic features where the species breeds. The decreased breeding success of the limited number of relictual slender salamanders exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of relictual slender salamanders could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of up to 5 individuals would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 23.25 acres of modeled relictual slender salamander habitat and permanently affect up to 0.10 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 30,553 acres of suitable habitat for the relictual slender salamander throughout the species' range, of which 986 acres (3.23 percent) occur within the study area. Therefore, project activities may affect up to 0.076 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of relictual slender salamander by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of relictual slender salamander.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the relictual slender salamander. Project activities would not increase the regional threats currently affecting the relictual slender salamander as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Western Spadefoot, Northern DPS</u>

We expect that adverse effects to western spadefoot could include increased noise and vibration; changes in topography; introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; introduction of invasive plants; changes in hydrology; disturbance or removal of surface/subsurface refugia; vehicle strikes; and physical capture, collection, or handling. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where western spadefoot are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the western spadefoot rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Caltrans will also completely avoid direct impacts (i.e., ground disturbance) to aquatic features where the species breeds. The decreased breeding success of the limited number of western spadefoot exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of western spadefoot could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of up to 30 individuals would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 4,321 acres of modeled western spadefoot habitat and permanently affect up to 17.89 acres, as described in Chapter 4 of the PBA (Caltrans 2024). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 20,828,094 acres of suitable habitat for the western spadefoot throughout the species' range, of which 215,103 acres (1.03 percent) occur within the study area. Therefore, project activities may affect up to 0.021 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of western spadefoot by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of western spadefoot.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the western spadefoot. Project activities would not increase the regional threats currently affecting the western spadefoot as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

Western Spadefoot, Southern DPS

We expect that adverse effects to western spadefoot could include increased noise and vibration; changes in topography; introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; introduction of invasive plants; changes in hydrology; disturbance or removal of surface/subsurface refugia; vehicle strikes; and physical capture, collection, or handling. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where western spadefoot are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the western spadefoot rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). Caltrans will also completely avoid direct impacts (i.e., ground disturbance) to aquatic features where the species breeds. The decreased breeding success of the limited number of western spadefoot exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of western spadefoot could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of up to 15 individuals would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 953 acres of modeled western spadefoot habitat and permanently affect up to 3.95 acres, as described in Chapter 4 of the PBA (Caltrans 2024). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 3,863,302 acres of suitable habitat for the western spadefoot throughout the species' range, of which 47,180 acres (1.22 percent) occur within the study area. Therefore, project activities may affect up to 0.025 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of western spadefoot by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of western spadefoot.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the western spadefoot. Project activities would not increase the regional threats currently affecting the western spadefoot as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Effects to Critical Habitats</u>

We anticipate that project activities could result in adverse effects to covered amphibian critical habitats, including:

- *Disturbance to soils or vegetation* – Project activities that disturb soils or vegetation could result in the physical loss of critical habitat or adverse effects to PBFs. Caltrans would avoid or minimize these effects by implementing conservation measures, including design measures to ensure that permanent facilities such as vaults and maintenance vehicle pullouts are not located in areas with PBFs, and that all temporary impacts to areas with PBFs are either avoided or, if avoidance is not possible, restored or mitigated for.

- *Increased erosion and sedimentation* – Project activities that involve removal of vegetation and disturbance of soils, like trenching or plowing, could result in increased erosion and sedimentation. This could cause adverse effects such as degradation of the PBFs of critical habitats for covered insects. These effects would be limited to the construction phase and would be minimized by implementation of conservation measures which limit project activities during rain events and implement standard stormwater BMPs, as well as establish work windows and activity buffers. Implementing these measures will reduce the potential for adverse effects on the PBFs of covered amphibian critical habitats due to erosion and sedimentation.

- *Introduction of invasive plants* – Project activities may introduce non-native plant species that alter the composition of critical habitats and adversely affect PBFs. For example, seeds of invasive plants may become lodged in construction vehicle tires from within or outside the action area, then be deposited into the action area during construction. In addition, ground disturbing activities, including those that remove vegetation or alter the substrate, may lead to increased colonization by invasive species. Caltrans will implement conservation measures to avoid or minimize the risk of introducing or spreading invasive plants.

- *Disturbance or removal of surface/subsurface refugia* – Project activities that involve excavation, ground disturbance, or vegetation removal could disturb or remove refugia that contribute to PBFs for breeding or sheltering. This could include destruction of subsurface burrows or the removal of features such as woody debris and leaf litter in amphibian critical habitat. Caltrans will minimize these effects with conservation measures, including design measures, which will ensure that refugia are avoided and that temporarily disturbed areas are revegetated. Implementing these measures will reduce potential adverse effects to PBFs that rely on the presence of surface/subsurface refugia.

- *Changes in water quality* –Operation of heavy equipment, removal of vegetation, and ground-disturbing activities within project footprints in close proximity to aquatic resources could result in changes to water quality in the action area through increased transportation of sediment or other contaminants as well as alterations to water temperature. Changes in water quality could result in acute and longer-term adverse effects to the PBFs of covered amphibian critical habitats. These effects would occur primarily during construction phase due to ground disturbance, but could persist beyond construction. The effects will be minimized through application of conservation measures, including the development and implementation of plans for prompt and effective response to any accidental spills, and limiting refueling and maintenance of heavy equipment within 150 feet of aquatic habitat. Site restoration would minimize the duration of these effects. Other general and species-specific measures will be implemented to minimize construction activities near covered amphibian critical habitats and avoid work in the rainy season. Implementation of these measures would reduce potential exposure of covered amphibian critical habitats to changes in water quality.

- *Changes in air quality* – Project activities that involve the operation of heavy equipment, removal of vegetation, and other ground disturbing activities, like trenching or plowing, could result in changes in air quality by releasing dust and other particulate matter into the air. Changes in air quality could cause adverse effects such as degradation of the PBFs of covered amphibian critical habitats. These effects would be limited to the construction phase when the ground is disturbed and would be avoided and minimized by implementation of conservation measures. These measures will limit construction activities near covered amphibian critical habitat, which will reduce the potential for adverse effects on covered amphibian critical habitats due to changes in air quality.

- *Introduction of invasive competitors or disease* – Project activities may introduce invasive species or disease to work areas through contamination of equipment, vehicles, personnel, or materials such as soils used for backfilling. In addition, ground disturbing activities, including those that remove vegetation or alter the substrate, may lead to increased colonization by invasive species. Potential effects to covered amphibian critical habitats by invasive competitors or disease vary widely depending on the invasive species or disease. Competition or introduction of disease could result in the degradation of the PBFs of covered amphibian critical habitats by decreasing the resources needed to support the PBFs. These effects would be minimized by implementation of conservation measures that minimize and restore impacts near covered amphibian critical habitats; implement BMPs to limit the introduction of invasive species on equipment, vehicles, personnel, and materials; and ensure good site keeping. These measures would reduce the potential adverse effects to covered amphibian critical habitats by minimizing the introduction of invasive species and disease.

- *Changes in hydrology* – Project activities that involve excavation adjacent to aquatic resources (e.g., trenching to install conduit) could result in changes to hydrology which could in turn affect covered amphibian critical habitats. Project activities associated with HDD, jack and drill, and at conduit and vault installation sites would generally result in limited adverse effects to covered amphibian critical habitats because these activities would be small in size, and because Caltrans will avoid critical habitats to the extent practicable. Changes in hydrology could include modification of the PBFs of covered amphibian critical habitats. These changes would be most pronounced in seasonal aquatic habitats but could also impact soil moisture levels in uplands. These consequences would be avoided and minimized by implementing conservation measures that will avoid installation of permanent infrastructure (i.e., vaults and network hubs) in covered amphibian critical habitats, restore and recontour topography to original grade, and establish avoidance buffers around covered amphibian critical habitats.

<u>California Red-legged Frog Critical Habitat</u>

We expect that adverse effects to California red-legged frog critical habitat could include: disturbance to soils or vegetation; increased erosion and sedimentation; changes in water quality; introduction of invasive plants; disturbance or removal of surface/subsurface refugia; changes in air quality; changes in hydrology; and introduction of invasive competitors or disease. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could temporarily affect up to 304.74 acres of critical habitat for the California red-legged frog, and permanently affect up to 1.26 acres. The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents 0.72 percent of 1,640,467 total acres of the critical habitat for California red-legged frog. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of California red-legged frog critical habitat.

California Tiger Salamander, Central California DPS Critical Habitat

We expect that adverse effects to California tiger salamander critical habitat could include: disturbance to soils or vegetation; increased erosion and sedimentation; changes in water quality; introduction of invasive plants; disturbance or removal of surface/subsurface refugia; changes in air quality; changes in hydrology; and introduction of invasive competitors or disease. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could temporarily affect up to 103.39 acres of critical habitat for the California tiger salamander, and permanently affect up to 0.43 acre. The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents 2.13 percent of 199,070 total acres of the critical habitat for California tiger salamander. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of California tiger salamander critical habitat.

California Tiger Salamander, Santa Barbara County DPS Critical Habitat

We expect that adverse effects to California tiger salamander critical habitat could include: disturbance to soils or vegetation; increased erosion and sedimentation; changes in water quality; introduction of invasive plants; disturbance or removal of surface/subsurface refugia; changes in air quality; changes in hydrology; and introduction of invasive competitors or disease. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could temporarily affect up to 13.57 acres of critical habitat for the California tiger salamander, and permanently affect up to 0.06 acre. The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents 3.43 percent of 11,176 total acres of the critical habitat for California tiger salamander. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of California tiger salamander critical habitat.

California Tiger Salamander, Sonoma DPS Critical Habitat

We expect that adverse effects to California tiger salamander critical habitat could include: disturbance to soils or vegetation; increased erosion and sedimentation; changes in water quality; introduction of invasive plants; disturbance or removal of surface/subsurface refugia; changes in air quality; changes in hydrology; and introduction of invasive competitors or disease. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could temporarily affect up to 41.34 acres of critical habitat for the California tiger salamander, and permanently affect up to 0.17 acre. The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents 3.24 percent of 47,418 total acres of the critical habitat for California tiger salamander. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of California tiger salamander critical habitat.

Effects of the Action on Insects

Any covered insects that occur within the action area could be adversely affected by project activities. Caltrans would avoid or minimize effects to covered insects by implementing general and insect-specific conservation measures. Implementing these measures would establish seasonal work windows to avoid the species' flight season, establish avoidance buffers around host/nectaring plants (i.e., plants that support various life stages or foraging material for covered insects), complete preconstruction surveys, and monitor construction. Here we describe potential adverse effects to covered insects and insect critical habitats. We further list relevant effects for each covered insect and insect critical habitat in their respective subheading.

Effects to Species

We anticipate that adverse effects to covered insect species could include the following:

- *Increased erosion and sedimentation* – Project activities that involve removal of vegetation and disturbance of soils, like trenching or plowing, could result in increased erosion and sedimentation. This could cause adverse effects such as degradation of suitable habitat for covered insects or the host/nectaring plants upon which they depend for survival. These effects would be limited to the construction phase and would be minimized by implementation of conservation measures which limit project activities during rain events and implement standard stormwater BMPs, as well as establish work windows and activity buffers. Implementing these measures will reduce the potential for adverse effects on covered insects due to erosion and sedimentation.

- *Increase in temperature* – Project activities that involve removal of vegetation, like trenching or plowing, could result in increased temperatures in the microhabitats that covered insects depend upon for survival. This could cause adverse effects such as degradation of suitable habitat through a reduction in soil moisture, and result in changes in plant physiology including changes in evapotranspiration which leads to wilting. These consequences to local populations of host/nectaring plants for covered insect species may extend beyond the construction phase until sites are restored to pre-project conditions, but given the small width of the project footprint (up to 20 feet wide), we do not expect project activities to result in significant changes to thermal profiles at the landscape level. Caltrans will implement conservation measures to reduce the potential for adverse effects on covered insect species due to increases in temperature by limiting impacts to known covered insect populations adjacent to the roadway and restoring project sites to pre-project conditions.

- *Increased noise and vibration* – Operation of heavy equipment could result in localized increases in noise and vibration. Increased noise and vibration could temporarily impair essential behaviors of covered insects, including breeding, foraging, and sheltering, if individuals utilize sub-optimal habitats to avoid noisy areas. These effects would be limited to the construction phase and would be avoided and minimized by implementation of conservation measures. These measures will limit construction activities to specific times of year and avoid covered insect species' sensitive life history events (e.g., flight season) as practicable. Implementing these measures will reduce the potential for adverse effects on covered insects due to increased noise and vibration.

- *Changes in topography* – Project activities that involve excavation, including conduit and vault installation, could result in temporary changes in topography. Locations of vaults, maintenance vehicle pullouts, and network hubs would also require excavation and would result in minor, localized changes in topography. Temporary changes in topography could result in the entrapment of covered insects and confine individuals to excavated areas with no escape, which may expose individuals to predation, increase stress, and impair essential behaviors. These consequences would be avoided and minimized by implementation of conservation measures which will avoid installation of permanent infrastructure (i.e., vaults, maintenance vehicle pullouts, and network hubs) in suitable habitat, restore and recontour topography to original grade, prevent species entrapment, and establish avoidance buffers around suitable habitats to the extent practicable. Implementing these measures will reduce the potential for adverse effects on covered insects due to changes in topography.

- *Introduction of hazardous materials* – Operation of heavy equipment and the associated refueling and maintenance needs would require the use of potential contaminants that, if released into the environment could result in adverse effects to covered insects and the host/nectaring plants they depend upon. Exposure to contaminants could cause both acute and longer-term food-web based responses within the action area. Direct exposure to hazardous materials could also result in injury or death to individuals through acute toxicity. These consequences would be limited to the construction phase and will be minimized with conservation measures to minimize the risk of introducing hazardous materials during project activities. Other, insect-specific conservation measures will limit construction activities to occur outside of the species sensitive period, to the extent practicable. Additional measures require the development and implementation of a plan for prompt and effective response to any accidental spills. Implementing these measures will reduce the potential for adverse effects on covered insects due to the introduction of hazardous materials.

- *Changes in air quality* – Project activities that involve the operation of heavy equipment, removal of vegetation, and other ground disturbing activities, like trenching or plowing, could result in changes in air quality. This could result in the degradation of suitable habitat for covered insects, including their host/nectaring plants, and could impair essential behaviors, including foraging and breeding. These effects would be limited to the construction phase and would be avoided or minimized by implementation seasonal work windows, which limits construction activities to specific times of year and avoids covered insects' sensitive life history events (e.g., flight season), to the extent feasible. Implementing these measures will reduce the potential for adverse effects on covered insects due to changes in air quality.

- *Introduction of invasive competitors or disease* – Project activities may introduce invasive animals or disease to work areas through contamination of equipment, vehicles, personnel, or materials such as soils used for backfilling. Potential effects to covered insects by an invasive competitor or disease vary widely depending on the invasive species or disease, but competition or disease can cause stress to individuals that makes them more susceptible to disease or less able to compete with invasive species, which can ultimately impair essential behaviors, such as breeding, foraging, and sheltering. These effects will be minimized by implementing conservation measures that limit construction activities to occur outside of sensitive habitats; minimize and restore impacts near covered insect populations; implement BMPs to limit the introduction of invasive species on equipment, vehicles, personnel, and materials; and ensure good site keeping. Together, these measures will reduce the potential adverse effects to covered insects by minimizing the introduction of invasive competitors and disease.

- *Introduction of invasive plants* – Project activities may introduce non-native plant species that alter the composition of suitable habitats for covered insects. For example, seeds of invasive plants may become lodged in construction vehicle tires from within or outside the action area, then be deposited into the action area during construction. In addition, ground disturbing activities, including those that remove vegetation or alter the substrate, may lead to increased colonization by invasive species. The introduction of invasive plants may degrade suitable habitat for covered insects to the extent that the habitat no longer supports the survival of individuals in the local area (e.g., host/nectaring plants can no longer survive, leading to a loss of habitat for covered insects). Caltrans will implement conservation measures to avoid or minimize the risk of introducing or spreading invasive plants.

- *Disturbance or removal of surface/subsurface refugia* – Project activities that involve excavation, ground disturbance, or vegetation removal could disturb or remove refugia used by covered insects, which could impair essential sheltering behavior. This could include destruction of subsurface burrows or the removal of features such as woody debris and leaf litter. These effects will be minimized through implementation of conservation measures, including design measures, which will ensure that suitable habitat is avoided and that temporarily disturbed areas are revegetated. Implementing these measures will reduce the potential for adverse effects on covered insects due to disturbance or removal of surface/subsurface refugia.

- *Changes in hydrology* – Project activities that involve excavation could cause changes in the hydrology of nearby aquatic habitats. Excavation would not occur within aquatic habitats; however, excavation may occur in adjacent uplands. In these instances, excavation could result in minor, localized changes in hydrology. Changes in hydrology could adversely affect covered insects by modifying habitats for the host/nectaring plants that the species depend upon for survival, for example by altering inundation duration, or causing minor changes in flows. We expect that these changes would be most pronounced in seasonal aquatic habitats where they may expose host/nectaring plants to increased predation or stress, and impair essential behaviors such as breeding, foraging, or sheltering. These effects will be minimized by implementing conservation measures to limit installing permanent infrastructure (i.e., vaults, and network hubs) in suitable habitat for covered insects, restore and recontour topography to original grade, and establish avoidance buffers around suitable habitats.

- *Disturbance or removal of vegetation* – Project activities could result in disturbance or removal of vegetation, including host/nectaring plants that covered insects depend upon for survival, leading to injury or mortality if the activities are not located on the roadway or other disturbed areas. For example, project activities could crush, cover or remove host/nectaring plants and individuals of covered insects that are slow moving (e.g., caterpillars) or immobile (e.g., eggs) may be impacted because they would not be able to escape. These effects would be minimized through implementation of the conservation measures, including establishing avoidance buffers around suitable habitats for covered insects, as well as implementing BMPs such as preconstruction surveys and seasonal work windows.

- *Physical capture, collection, or handling* – Implementation of relocation efforts during construction activities would result in the capture and handling of individual covered insects. Capturing and handling individuals that would otherwise be subject to more severe adverse effects may result in injury or mortality, but we anticipate that rates of injury or mortality would be much lower than if Caltrans did not attempt to relocate covered insects at risk of more severe effects. Implementation of a relocation plan would minimize the adverse effects to covered insects resulting from physical capture, collection, or handling.

Bay Checkerspot Butterfly

We expect that adverse effects to Bay checkerspot butterfly could include: increased erosion and sedimentation; increase in temperature; changes in water quality, introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; and direct disturbance to individuals. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Bay checkerspot butterfly is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect all eggs and larva present on up to 50 host plants, any lost productivity associated with the loss of those host plants is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one reproductive cycle). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some injury or mortality of Bay checkerspot butterfly could occur during project activities. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. We anticipate that the mortality or injury of all individuals that rely on up to 50 host plants would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 16.23 acres of modeled Bay checkerspot butterfly habitat and permanently affect up to 0.07 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 41,145 acres of suitable habitat for the Bay checkerspot butterfly throughout the species' range, of which 795 acres (1.93 percent) occur within the study area. Therefore, project activities may affect up to 0.039 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Bay checkerspot butterfly by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Bay checkerspot butterfly.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Bay checkerspot butterfly. Project activities would not increase the regional threats currently affecting Bay checkerspot butterfly as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Behren's Silverspot Butterfly</u>

We expect that adverse effects to Behren's silverspot butterfly could include: increased erosion and sedimentation; increase in temperature; changes in water quality, introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; and direct disturbance to individuals. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Behren's silverspot butterfly is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect all eggs and larva present on up to 75 host plants, any lost productivity associated with the loss of those host plants is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one reproductive cycle). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some injury or mortality of Behren's silverspot butterfly could occur during project activities. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. We anticipate that the mortality or injury of all individuals that rely upon up to 75 host plants would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 119.36 acres of modeled Behren's silverspot butterfly habitat and permanently affect up to 0.49 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 27,955 acres of suitable habitat for the Behren's silverspot butterfly throughout the species' range, of which 5,631 acres (20.15 percent) occur within the study area. Therefore, project activities may affect up to 0.427 percent of the species' rangewide habitat temporarily, and less than 0.002 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Behren's silverspot butterfly by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Behren's silverspot butterfly.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Behren's silverspot butterfly. Project activities would not increase the regional threats currently affecting Behren's silverspot butterfly as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Callippe Silverspot Butterfly</u>

We expect that adverse effects to Callippe silverspot butterfly could include: increased erosion and sedimentation; increase in temperature; changes in water quality, introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; and direct disturbance to individuals. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Callippe silverspot butterfly is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect all eggs and larva present on up to 50 host plants, any lost productivity associated with the loss of those host plants is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one reproductive cycle). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some injury or mortality of Callippe silverspot butterfly could occur during project activities. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. We anticipate that the mortality or injury of all individuals that rely upon up to 50 host plants would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 15.90 acres of modeled Callippe silverspot butterfly habitat and permanently affect up to 0.07 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 45,194 acres of suitable habitat for the Callippe silverspot butterfly throughout the species' range, of which 760 acres (1.68 percent) occur within the study area. Therefore, project activities may affect up to 0.035 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Callippe silverspot butterfly by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Callippe silverspot butterfly.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Callippe silverspot butterfly. Project activities would not increase the regional threats currently affecting Callippe silverspot butterfly as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Casey's June Beetle</u>

We expect that adverse effects to Casey's June beetle could include: increased erosion and sedimentation; increase in temperature; changes in water quality, introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Casey's June beetles are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the Casey's June beetle rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). The decreased breeding success of the limited number of Casey's June beetles exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of Casey's June beetles could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of up to 5 individuals would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 0.67 acre of modeled Casey's June beetle habitat and permanently affect less than 0.001 acre, as described in Chapter 4 of the PBA (Caltrans

2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 993 acres of suitable habitat for the Casey's June beetle throughout the species' range, of which 33 acres (3.31 percent) occur within the study area. Therefore, project activities may affect up to 0.067 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Casey's June beetle by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Casey's June beetle.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Casey's June beetle. Project activities would not increase the regional threats currently affecting Casey's June beetle as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

Delhi Sands Flower-loving Fly

We expect that adverse effects to Dehli sands flower-loving fly could include: increased erosion and sedimentation; increase in temperature; changes in water quality, introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; and direct disturbance to individuals. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Dehli sands flower-loving fly is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect all eggs and larva present on host plants that occur on the maximum of 0.62 acre of suitable habitat that may be temporarily impacted by the project, any lost productivity associated with the loss of those host plants is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one reproductive cycle). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some injury or mortality of Dehli sands flower-loving fly could occur during project activities. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. We anticipate that the mortality or injury of all individuals that rely upon the maximum of 0.62 acre of suitable habitat that may be temporarily impacted by the project would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 0.62 acre of modeled Dehli sands flower-loving fly habitat and permanently affect less than 0.001 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 3,190 acres of suitable habitat for the Dehli sands flower-loving fly throughout the species' range, of which 30 acres (0.955 percent) occur within the study area. Therefore, project activities may affect up to 0.019 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Dehli sands flower-loving fly by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Dehli sands flower-loving fly.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Dehli sands flower-loving fly. Project activities would not increase the regional threats currently affecting Dehli sands flower-loving fly as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Mission Blue Butterfly</u>

We expect that adverse effects to Mission blue butterfly could include: increased erosion and sedimentation; increase in temperature; changes in water quality, introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; and direct disturbance to individuals. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Mission blue butterfly is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect all eggs and larva present on up to 50 host plants, any lost productivity associated with the loss of those host plants is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one reproductive cycle). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some injury or mortality of Mission blue butterfly could occur during project activities. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. We anticipate that the mortality or injury of all individuals that rely upon up to 50 host plants would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 13.14 acres of modeled Mission blue butterfly habitat and permanently affect up to 0.05 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 27,852 acres of suitable habitat for the Mission blue butterfly throughout the species' range, of which 651 acres (2.34 percent) occur within the study area. Therefore, project activities may affect up to 0.047 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Mission blue butterfly by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Mission blue butterfly.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Mission blue butterfly. Project activities would not increase the regional threats currently affecting Mission blue butterfly as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

Monarch Butterfly

We expect that adverse effects to monarch butterfly could include: increased erosion and sedimentation; increase in temperature; changes in water quality, introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; and direct disturbance to individuals. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where monarch butterfly is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect all eggs and larva present on up to 100 host plants, any lost productivity associated with the loss of those host plants is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one reproductive cycle). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some injury or mortality of monarch butterfly could occur during project activities. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. We anticipate that the mortality or injury of all individuals that rely upon up to 100 host plants would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 4,512.83 acres of modeled monarch butterfly habitat and permanently affect up to 18.68 acres, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 22,633,484 acres of suitable habitat for the monarch butterfly throughout the species' range, of which 224,074 acres (0.99 percent) occur within the study area. Therefore, project activities may affect up to 0.02 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of monarch butterfly by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small percentage of permanent impacts to the species given its broad range, and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of monarch butterfly.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of monarch butterfly. Project activities would not increase the regional threats currently affecting monarch butterfly as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Mount Herman June Beetle</u>

We expect that adverse effects to Mount Herman June beetle could include: increased erosion and sedimentation; increase in temperature; changes in water quality, introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Mount Herman June beetles are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. However, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the Mount Herman June beetle rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one breeding season). The decreased breeding success of the limited number of Mount Herman June beetles exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of Mount Herman June beetles could occur during project activities, or during capture and relocation. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of up to 5 individuals would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 0.17 acres of modeled Mount Herman June beetle habitat and permanently affect up to 0.001 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 1,122 acres of suitable habitat for the Mount Herman June beetle throughout the species' range, of which 8 acres (0.723 percent) occur within the study area. Therefore, project activities may affect up to 0.015 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Mount Herman June beetle by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Mount Herman June beetle.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Mount Herman June beetle. Project activities would not increase the regional threats currently affecting Mount Herman June beetle as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Myrtle's Silverspot Butterfly</u>

We expect that adverse effects to Myrtle's silverspot butterfly could include: increased erosion and sedimentation; increase in temperature; changes in water quality, introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; and direct disturbance to individuals. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Myrtle's silverspot butterfly is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect all eggs and larva present on up to 75 host plants, any lost productivity associated with the loss of those host plants is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one reproductive cycle). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some injury or mortality of Myrtle's silverspot butterfly could occur during project activities. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. We anticipate that the mortality or injury of all individuals that rely upon up to 75 host plants would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 75.36 acres of modeled Myrtle's silverspot butterfly habitat and permanently affect up to 0.31 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 79,044 acres of suitable habitat for the Myrtle's silverspot butterfly throughout the species' range, of which 3,451 acres (4.37 percent) occur within the study area. Therefore, project activities may affect up to 0.095 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Myrtle's silverspot butterfly by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of permanent habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Myrtle's silverspot butterfly.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Myrtle's silverspot butterfly. Project activities would not increase the regional threats currently affecting Myrtle's silverspot butterfly as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Oregon Silverspot Butterfly</u>

We expect that adverse effects to Oregon silverspot butterfly could include: increased erosion and sedimentation; increase in temperature; changes in water quality, introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; and direct disturbance to individuals. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Oregon silverspot butterfly is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect all eggs and larva present on up to 50 host plants, any lost productivity associated with the loss of those host plants is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one reproductive cycle). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some injury or mortality of Oregon silverspot butterfly could occur during project activities. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. We anticipate that the mortality or injury of all individuals that rely upon up to 50 host plants would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 5.77 acres of modeled Oregon silverspot butterfly habitat and permanently affect up to 0.02 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 5,352 acres of suitable habitat for the Oregon silverspot butterfly throughout the species' range, of which 284 acres (5.306 percent) occur within the study area. Therefore, project activities may affect up to 0.108 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Oregon silverspot butterfly by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Oregon silverspot butterfly.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Oregon silverspot butterfly. Project activities would not increase the regional threats currently affecting Oregon silverspot butterfly as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Quino Checkerspot Butterfly</u>

We expect that adverse effects to Quino checkerspot butterfly could include: increased erosion and sedimentation; increase in temperature; changes in water quality, introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; and direct disturbance to individuals. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Quino checkerspot butterfly is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect all eggs and larva present on host plants that occur on the maximum of 10 acres of suitable habitat that would be temporarily impacted by the project and 0.02 acre of habitat that would be permanently impacted, any lost productivity associated with the loss of those host plants is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one reproductive cycle). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some injury or mortality of Quino checkerspot butterfly could occur during project activities. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. We anticipate that the mortality or injury of all individuals that rely upon the maximum of 10 acres of suitable habitat that would be temporarily impacted and 0.02 acre of suitable habitat that would be permanently impacted by project would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 10 acres of modeled Quino checkerspot butterfly habitat and permanently affect up to 0.02 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 418,414 acres of suitable habitat for the Quino checkerspot butterfly throughout the species' range, of which 7,766 acres (1.856 percent) occur within the study area. Therefore, project activities may affect up to 0.002 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Quino checkerspot butterfly by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Quino checkerspot butterfly.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Quino checkerspot butterfly. Project activities would not increase the regional threats currently affecting Quino checkerspot butterfly as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>San Bruno Elfin Butterfly</u>

We expect that adverse effects to San Bruno elfin butterfly could include: increased erosion and sedimentation; increase in temperature; changes in water quality, introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; and direct disturbance to individuals. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where San Bruno elfin butterfly is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect all eggs and larva present on up to 20 host plants, any lost productivity associated with the loss of those host plants is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one reproductive cycle). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some injury or mortality of San Bruno elfin butterfly could occur during project activities. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. We anticipate that the mortality or injury of all individuals that rely upon up to 20 host plants would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 1.16 acres of modeled San Bruno elfin butterfly habitat and permanently affect up to 0.001 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 1,643 acres of suitable habitat for the San Bruno elfin butterfly throughout the species' range, of which 54 acres (3.313 percent) occur within the study area. Therefore, project activities may affect up to 0.07 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of San Bruno elfin butterfly by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of San Bruno elfin butterfly.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of San Bruno elfin butterfly. Project activities would not increase the regional threats currently affecting San Bruno elfin butterfly as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Smith's Blue Butterfly</u>

We expect that adverse effects to Smith's blue butterfly could include: increased erosion and sedimentation; increase in temperature; changes in water quality, introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; and direct disturbance to individuals. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Smith's blue butterfly is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect all eggs and larva present on up to 50 host plants, any lost productivity associated with the loss of those host plants is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one reproductive cycle). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some injury or mortality of Smith's blue butterfly could occur during project activities. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. We anticipate that the mortality or injury of all individuals that rely upon up to 50 host plants would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 16.36 acres of modeled Smith's blue butterfly habitat and permanently affect up to 0.07 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 61,266 acres of suitable habitat for the Smith's blue butterfly throughout the species' range, of which 817 acres (1.33 percent) occur within the study area. Therefore, project activities may affect up to 0.027 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Smith's blue butterfly by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Smith's blue butterfly.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Smith's blue butterfly. Project activities would not increase the regional threats currently affecting Smith's blue butterfly as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Valley Elderberry Longhorn Beetle</u>

We expect that adverse effects to Valley elderberry longhorn beetle could include: increased erosion and sedimentation; increase in temperature; changes in water quality, introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Valley elderberry longhorn beetle is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect all eggs, larva, or adults present on up to 100 host plants, any lost productivity associated with the loss of those host plants is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one reproductive cycle). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some injury or mortality of Valley elderberry longhorn beetle could occur during project activities, including capture when host plants are relocated. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that

Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of all individuals that rely upon up to 100 host plants would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 22.72 acres of modeled Valley elderberry longhorn beetle habitat and permanently affect up to 0.09 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 88,383 acres of suitable habitat for the Valley elderberry longhorn beetle throughout the species' range, of which 1,131 acres (1.279 percent) occur within the study area. Therefore, project activities may affect up to 0.026 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Valley elderberry longhorn beetle by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Valley elderberry longhorn beetle.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Valley elderberry longhorn beetle. Project activities would not increase the regional threats currently affecting Valley elderberry longhorn beetle as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

Effects to Critical Habitats

We anticipate that project activities could result in adverse effects to covered insect critical habitats, including:

- *Increased erosion and sedimentation* – Project activities that involve removal of vegetation and disturbance of soils, like trenching or plowing, could result in increased erosion and sedimentation. This could cause adverse effects such as degradation of the PBFs of critical habitats for covered insects. These effects would be limited to the construction phase and would be minimized by implementation of conservation measures which limit project activities during rain events and implement standard stormwater BMPs, as well as establish work windows and activity buffers. Implementing these measures will reduce the potential for adverse effects on the PBFs of covered insect critical habitats due to erosion and sedimentation.

- *Increase in temperature* – Project activities that involve removal of vegetation, like trenching or plowing, could result in increased temperatures in the microhabitats that support the PBF of covered insect critical habitats. This could cause adverse effects such as degradation of the PBFs of covered insect critical habitat through a reduction in soil moisture, and result in changes in plant physiology including changes in evapotranspiration which leads to wilting. These consequences to the PBFs for covered insect critical habitats may extend beyond the construction phase until sites are restored to pre-project conditions but given the small width of the project footprint (up to 20 feet wide), we do not expect project activities to result in significant changes to thermal profiles at the landscape level. Caltrans will implement conservation measures to reduce the potential for adverse effects on the PBFs of covered insect critical habitats due to increases in temperature by limiting impacts to known covered insect populations adjacent to the roadway and restoring project sites to pre-project conditions.

- *Introduction of hazardous materials* – Operation of heavy equipment and the associated refueling and maintenance needs would require the use of potential contaminants that, if released into the environment could result in adverse effects to critical habitat for covered insects. Exposure to contaminants could degrade the PBFs of critical habitat for covered insects. These consequences would be limited to the construction phase and will be minimized with conservation measures to minimize the risk of introducing hazardous materials during project activities. Additional measures require the development and implementation of a plan for prompt and effective response to any accidental spills. Implementing these measures will reduce the potential for adverse effects to critical habitat due to the introduction of hazardous materials.

- *Changes in air quality* – Project activities that involve the operation of heavy equipment, removal of vegetation, and other ground disturbing activities, like trenching or plowing, could result in changes in air quality by releasing dust and other particulate matter into the air. Changes in air quality could cause adverse effects such as degradation of the PBFs of covered insect critical habitats. These effects would be limited to the construction phase when the ground is disturbed and would be avoided and minimized by implementation of conservation measures. These measures will limit construction activities near covered insect critical habitat, which will reduce the potential for adverse effects due to changes in air quality.

- *Introduction of invasive competitors or disease* – Project activities may introduce invasive animals or disease to work areas through contamination of equipment, vehicles, personnel, or materials such as soils used for backfilling. Potential effects to the PBFs of covered insect critical habitats by an invasive competitor or disease vary widely depending on the invasive species or disease, but competition or disease can cause stress to host/nectaring plants to the extent that can ultimately impair the PBFs from functioning to support the conversation of covered insect critical habitat. These effects will be minimized by implementing conservation measures that limit construction activities to occur outside of critical habitat for covered insects; minimize and restore impacts; implement BMPs to limit the introduction of invasive species on equipment, vehicles, personnel, and materials; and ensure good site keeping. Together, these measures will reduce the potential adverse effects to covered insect critical habitats by minimizing the introduction of invasive competitors and disease.

- *Introduction of invasive plants* – Project activities may introduce non-native plant species that alter the composition of covered insect critical habitats. For example, seeds of invasive plants may become lodged in construction vehicle tires from within or outside the action area, then be deposited into the action area during construction. In addition, ground disturbing activities, including those that remove vegetation or alter the substrate, may lead to increased colonization by invasive species. The introduction of invasive plants may degrade the PBFs of covered insect critical habitat to the extent that the PBFs no longer function to support the critical habitat. Caltrans will implement conservation measures to avoid or minimize the risk of introducing or spreading invasive plants.

- *Changes in hydrology* – Project activities that involve excavation could cause changes in the hydrology of nearby aquatic habitats. Excavation would not occur within aquatic habitats; however, excavation may occur in adjacent uplands. In these instances, excavation could result in minor, localized changes in hydrology. Changes in hydrology could adversely affect covered insect critical habitats by modifying the PBFs of critical habitat, for example by altering inundation duration, or causing minor changes in flows. We expect that these changes would be most pronounced in seasonal aquatic habitats where they may expose vegetation supporting the PBFs to increased stress. These effects will be minimized by implementing conservation measures to limit installing permanent infrastructure (i.e., vaults, and network hubs) in critical habitat for covered insects, restore and recontour topography to original grade, and establish avoidance buffers around critical habitats.

- *Disturbance or removal of vegetation* – Project activities could result in disturbance or removal of vegetation that support the PBFs of critical habitat for covered insects if the activities are not located on the roadway or other disturbed areas. These effects would be minimized through implementation of the conservation measures, including establishing avoidance buffers around critical habitats for covered insects.

<u>Bay Checkerspot Butterfly Critical Habitat</u>

We expect that adverse effects to Bay checkerspot butterfly critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality, introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 13.66 acres temporarily and 0.06 acre permanently of critical habitat for the Bay checkerspot butterfly (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents 0.69 percent of 18,301 total acres of the critical habitat for Bay checkerspot butterfly. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Bay checkerspot butterfly critical habitat.

Quino Checkerspot Butterfly Critical Habitat

We expect that adverse effects to Quino checkerspot butterfly critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality, introduction of hazardous materials; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 31.66 acres temporarily and 0.13 acre permanently of critical habitat for the Quino checkerspot butterfly (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 1.65 percent of 62,174 total acres of the critical habitat for Quino checkerspot butterfly. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Quino checkerspot butterfly critical habitat.

Effects of the Action on Crustaceans

Any covered crustaceans that occur within the action area could be adversely affected by project activities. Caltrans would generally avoid construction in vernal pools and seasonal wetlands/swales. However, in some locations direct effects to vernal pools or seasonal wetlands/swales may occur if project activities are within 250 feet. Caltrans would avoid or minimize effects to covered crustaceans by implementing general and crustacean-specific conservation measures. Implementing these measures would establish seasonal work windows to avoid the species' sensitive season, establish avoidance buffers around vernal pools, complete preconstruction surveys, and monitor construction, among other measures. Here we describe potential adverse effects to covered crustaceans and crustacean critical habitats. We further list relevant effects for each covered crustacean and crustacean critical habitat in their respective subheading.

Effects to Species

We anticipate that adverse effects to covered crustacean species could include the following:

- *Increased erosion and sedimentation, including turbidity* – Project activities that involve removal of vegetation and disturbance of soils, like trenching or plowing, could result in increased erosion and sedimentation, including turbidity. This could cause adverse effects such as degradation of suitable habitat, and potentially bury, or (in the case of increased turbidity), smother covered crustaceans. These effects would be limited to the construction phase and would be minimized by implementation of conservation measures which will reduce project activities during rain events and implement standard stormwater BMPs, as well as establish work windows and activity buffers. Implementing these measures will reduce the potential for adverse effects on covered crustaceans due to erosion and sedimentation.

- *Increase in temperature* – Project activities that involve removal of vegetation, like trenching or plowing, could result in increased temperatures in the microhabitats where covered crustaceans occur. This could cause adverse effects such as degradation of suitable habitat through a reduction in soil moisture. These consequences to local populations of covered crustaceans may extend beyond the construction phase until sites are restored to pre-project conditions, but given the small width of the project footprint (up to 20 feet wide), we do not expect project activities to result in significant changes to thermal profiles at the landscape level. Caltrans will implement conservation measures to reduce the potential for adverse effects on covered plant species due to increases in temperature by limiting impacts to known covered crustacean occurrences adjacent to the roadway and restoring project sites to pre-project conditions.

- *Introduction of hazardous materials* – Operation of heavy equipment and the associated refueling and maintenance needs would require the use of potential contaminants that, if released into the environment could result in adverse effects to covered crustaceans. Exposure to contaminants could cause both acute and longer-term food-web based responses within the project footprint and may in some instances extend beyond the footprint. Direct exposure to hazardous materials could also result in injury or death to individuals through acute toxicity. These consequences would be limited to the construction phase and will be minimized with conservation measures to minimize the risk of introducing hazardous materials during project activities. Other, crustacean-specific conservation measures will require construction activities to occur outside of the species sensitive period, avoid work in species habitat during the rainy season, and prohibit work within a 250-foot buffer around suitable aquatic habitats. Additional measures require the development and implementation of a plan for prompt and effective response to any accidental spills, and limit refueling and maintenance of heavy equipment within 150 feet of aquatic habitat. Implementing these measures will reduce the potential for adverse effects on covered crustaceans due to the introduction of hazardous materials.

- *Introduction of invasive plants* – Project activities may introduce non-native plant species that alter the composition of suitable species habitats. For example, seeds of invasive plants may become lodged in construction vehicle tires from within or outside the action area, then be deposited into the action area during construction. In addition, ground disturbing activities, including those that remove vegetation or alter the substrate, may lead to increased colonization by invasive species. Caltrans will implement conservation measures to avoid or minimize the risk of introducing or spreading invasive plants.

- *Changes in hydrology* – Project activities that involve excavation could cause changes in the hydrology of nearby aquatic habitats. Excavation would not occur within aquatic habitats; however, excavation may occur in adjacent uplands. In these instances, excavation could result in minor, localized changes in hydrology. Changes in hydrology could adversely affect covered crustaceans by modifying suitable aquatic habitats, for example by altering inundation duration, or causing minor changes in flows. We expect that these changes would be most pronounced in seasonal aquatic habitats where they may expose individuals to increased predation or stress, and impair essential behaviors such as breeding, foraging, or sheltering. These effects will be minimized by implementing conservation measures to avoid installing permanent infrastructure (i.e., vaults, and network hubs) in suitable habitat, restore and recontour topography to original grade, and establish avoidance buffers around suitable habitats.

- *Disturbance or removal of surface/subsurface refugia* – Project activities that involve excavation, ground disturbance, or vegetation removal could disturb or remove refugia used by covered crustaceans, which could impair essential behaviors like sheltering by destroying subsurface cysts during the dry season. These effects will be minimized through implementation of conservation measures, including design measures, which will ensure that suitable habitat is avoided and that temporarily disturbed areas are revegetated. Implementing these measures will reduce the potential for adverse effects on covered crustaceans due to disturbance or removal of surface/subsurface refugia.

- *Vehicle strikes* – Vehicles or construction equipment could contact or crush covered crustaceans, leading to injury or death. Crustaceans are slow moving or immobile, and are susceptible to these impacts as they may not be able to escape or perceive the vehicle in time. Vehicle strikes will be minimized by implementing conservation measures that avoid suitable habitat and known populations, as well as implementing BMPs such as preconstruction surveys, daily clearance surveys, and vehicle speed limits.

Conservancy Fairy Shrimp

We expect that adverse effects to Conservancy fairy shrimp could include increased erosion and sedimentation, including turbidity; increase in temperature; introduction of hazardous materials; introduction of invasive plants; changes in hydrology; disturbance or removal of surface/subsurface refugia; and vehicle strikes. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Conservancy fairy shrimp are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. Although Conservancy fairy shrimp occurring in up to 25 acres of suitable aquatic habitat could have their reproduction disrupted, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the Conservancy fairy shrimp rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than 1 year). Caltrans will also completely avoid direct impacts (i.e., ground disturbance) to aquatic features where the species breeds. The decreased breeding success of the limited number of Conservancy fairy shrimp exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of Conservancy fairy shrimp could occur during project activities. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of all individuals in up to 25 acres of vernal pools that occur within 250 feet of project activities would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 1,369.91 acres of modeled Conservancy fairy shrimp habitat and permanently affect up to 5.67 acres, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 4,870,952 acres of suitable habitat for the Conservancy fairy shrimp throughout the species' range, of which 68,206 acres (1.4 percent) occur within the study area. Therefore, project activities may affect up to 0.028 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Conservancy fairy shrimp by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Conservancy fairy shrimp.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the Conservancy fairy shrimp. Project activities would not increase the regional threats currently affecting the Conservancy fairy shrimp as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

Longhorn Fairy Shrimp

We expect that adverse effects to longhorn fairy shrimp could include increased erosion and sedimentation, including turbidity; increase in temperature; introduction of hazardous materials; introduction of invasive plants; changes in hydrology; disturbance or removal of surface/subsurface refugia; and vehicle strikes. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where longhorn fairy shrimp are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. Although longhorn fairy shrimp occurring in up to 1 acre of suitable aquatic habitat could have their reproduction disrupted, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the longhorn fairy shrimp rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than 1 year). Caltrans will also completely avoid direct impacts (i.e., ground disturbance) to aquatic features where the species breeds. The decreased breeding success of the limited number of longhorn fairy shrimp exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of longhorn fairy shrimp could occur during project activities. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of all individuals in up to 1 acre of vernal pools that occur within 250 feet of project activities would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 3.85 acres of modeled longhorn fairy shrimp habitat and permanently affect up to 0.02 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 248,680 acres of suitable habitat for the longhorn fairy shrimp throughout the species' range, of which 204 acres (0.082 percent) occur within the study area. Therefore, project activities may affect up to 0.002 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of longhorn fairy shrimp by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of longhorn fairy shrimp.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the longhorn fairy shrimp. Project activities would not increase the regional threats currently affecting the longhorn fairy shrimp as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Riverside Fairy Shrimp</u>

We expect that adverse effects to Riverside fairy shrimp could include increased erosion and sedimentation, including turbidity; increase in temperature; introduction of hazardous materials; introduction of invasive plants; changes in hydrology; disturbance or removal of surface/subsurface refugia; and vehicle strikes. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Riverside fairy shrimp are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. Although Riverside fairy shrimp occurring in up to 1 acre of suitable aquatic habitat could have their reproduction disrupted, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the Riverside fairy shrimp rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than 1 year). Caltrans will also completely avoid direct impacts (i.e., ground disturbance) to aquatic features where the species breeds. The decreased breeding success of the limited number of Riverside fairy shrimp exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of Riverside fairy shrimp could occur during project activities. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of all individuals in up to 1 acre of vernal pools that occur within 250 feet of project activities would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 130.32 acres of modeled Riverside fairy shrimp habitat and permanently affect up to 0.54 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 293,368 acres of suitable habitat for the Riverside fairy shrimp throughout the species' range, of which 6,474 acres (2.21 percent) occur within the study area. Therefore, project activities may affect up to 0.044 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Riverside fairy shrimp by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Riverside fairy shrimp.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the Riverside fairy shrimp. Project activities would not increase the regional threats currently affecting the Riverside fairy shrimp as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>San Diego Fairy Shrimp</u>

We expect that adverse effects to San Diego fairy shrimp could include increased erosion and sedimentation, including turbidity; increase in temperature; introduction of hazardous materials; introduction of invasive plants; changes in hydrology; disturbance or removal of surface/subsurface refugia; and vehicle strikes. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where San Diego fairy shrimp are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. Although San Diego fairy shrimp occurring in up to 1 acre of suitable aquatic habitat could have their reproduction disrupted, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the San Diego fairy shrimp rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than 1 year). Caltrans will also completely avoid direct impacts (i.e., ground disturbance) to aquatic features where the species breeds. The decreased breeding success of the limited number of San Diego fairy shrimp exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of San Diego fairy shrimp could occur during project activities. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of all individuals in up to 1 acre of vernal pools that occur within 250 feet of project activities would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 21.14 acres of modeled San Diego fairy shrimp habitat and permanently affect up to 0.09 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 82,077 acres of suitable habitat for the San Diego fairy shrimp throughout the species' range, of which 1,048 acres (1.28 percent) occur within the study area. Therefore, project activities may affect up to 0.026 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of San Diego fairy shrimp by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of San Diego fairy shrimp.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the San Diego fairy shrimp. Project activities would not increase the regional threats currently affecting the San Diego fairy shrimp as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Vernal Pool Fairy Shrimp</u>

We expect that adverse effects to vernal pool fairy shrimp could include increased erosion and sedimentation, including turbidity; increase in temperature; introduction of hazardous materials; introduction of invasive plants; changes in hydrology; disturbance or removal of surface/subsurface refugia; and vehicle strikes. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where vernal pool fairy shrimp are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. Although vernal pool fairy shrimp occurring in up to 25 acres of suitable aquatic habitat could have their reproduction disrupted, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the vernal pool fairy shrimp rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than 1 year). Caltrans will also completely avoid direct impacts (i.e., ground disturbance) to aquatic features where the species breeds. The decreased breeding success of the limited number of vernal pool fairy shrimp exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of vernal pool fairy shrimp could occur during project activities. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of all individuals in up to 25 acres of vernal pools that occur within 250 feet of project activities would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 2,358.94 acres of modeled vernal pool fairy shrimp habitat and permanently affect up to 9.77 acres, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 9,647,699 acres of suitable habitat for the vernal pool fairy shrimp throughout the species' range, of which 117,061 acres (1.21 percent) occur within the study area. Therefore, project activities may affect up to 0.024 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of vernal pool fairy shrimp by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of vernal pool fairy shrimp.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the vernal pool fairy shrimp. Project activities would not increase the regional threats currently affecting the vernal pool fairy shrimp as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

Vernal Pool Tadpole Shrimp

We expect that adverse effects to vernal pool tadpole shrimp could include increased erosion and sedimentation, including turbidity; increase in temperature; introduction of hazardous materials; introduction of invasive plants; changes in hydrology; disturbance or removal of surface/subsurface refugia; and vehicle strikes. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where vernal pool tadpole shrimp are present. When project activities occur during the breeding season for the species, these local changes may temporarily result in decreased breeding success by individuals that are exposed to the changes if they alter their breeding behavior in response to project activities. Although vernal pool tadpole shrimp occurring in up to 25 acres of suitable aquatic habitat could have their reproduction disrupted, we do not anticipate that this project, as proposed, will meaningfully affect the reproductive capacity of the vernal pool tadpole shrimp rangewide because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than 1 year). Caltrans will also completely avoid direct impacts (i.e., ground disturbance) to aquatic features where the species breeds. The decreased breeding success of the limited number of vernal pool tadpole shrimp exposed to project activities would be undetectable at the scale of the species given the natural variation in the species' numbers and its life history as described in Appendix A. Thus, we expect that the proposed action would not measurably reduce the species' reproductive capacity locally or rangewide.

Numbers

Some injury or mortality of vernal pool tadpole shrimp could occur during project activities. We expect such injury and mortality to be very infrequent due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities and capture. We anticipate that the mortality or injury of all individuals in up to 25 acres of vernal pools that occur within 250 feet of project activities would be obscured by natural variation in the species' numbers, given their life history as described in Appendix A, such that any effect to the species' numbers overall would be negligible. Thus, we expect that the proposed action would not measurably reduce the species' numbers locally or rangewide.

Distribution

Project activities could temporarily affect up to 1,200.74 acres of modeled vernal pool tadpole shrimp habitat and permanently affect up to 4.97 acres, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 4,765,587 acres of suitable habitat for the vernal pool tadpole shrimp throughout the species' range, of which 59,679 acres (1.25 percent) occur within the study area. Therefore, project activities may affect up to 0.025 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of vernal pool tadpole shrimp by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate for those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of vernal pool tadpole shrimp.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of the vernal pool tadpole shrimp. Project activities would not increase the regional threats currently affecting the vernal pool tadpole shrimp as discussed in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Effects to Critical Habitats</u>

We anticipate that project activities could result in adverse effects to covered crustacean critical habitats, including:

- *Disturbance to soils or vegetation* – Project activities that disturb soils or vegetation could result in the physical loss of critical habitat or adverse effects to PBFs. Caltrans would avoid or minimize these effects by implementing conservation measures, including design measures to ensure that permanent facilities such as vaults and maintenance vehicle pullouts are not located in areas with PBFs, and that all temporary impacts to areas with PBFs are either avoided or, if avoidance is not possible, restored or mitigated for.

- *Increased erosion and sedimentation, including turbidity* – Project activities that involve removal of vegetation and disturbance of soils, like trenching or plowing, could result in increased erosion and sedimentation, including turbidity. This could cause adverse effects such as degradation of the PBFs of critical habitats for covered crustaceans. These effects would be limited to the construction phase and would be minimized by implementation of conservation measures which limit project activities during rain events and implement standard stormwater BMPs, as well as establish work windows and activity buffers. Implementing these measures will reduce the potential for adverse effects on the PBFs of covered crustacean critical habitats due to erosion and sedimentation.

- *Introduction of invasive plants* – Project activities may introduce non-native plant species that alter the composition of critical habitats and adversely affect PBFs. For example, seeds of invasive plants may become lodged in construction vehicle tires from within or outside the action area, then be deposited into the action area during construction. In addition, ground disturbing activities, including those that remove vegetation or alter the substrate, may lead to increased colonization by invasive species. Caltrans will implement conservation measures to avoid or minimize the risk of introducing or spreading invasive plants.

- *Disturbance or removal of surface/subsurface refugia* – Project activities that involve excavation, ground disturbance, or vegetation removal could disturb or remove refugia that contribute to PBFs for breeding or sheltering. Caltrans will minimize these effects with conservation measures, including design measures, which will ensure that refugia are avoided and that temporarily disturbed areas are revegetated. Implementing these measures will reduce potential adverse effects to PBFs that rely on the presence of surface/subsurface refugia.

- *Changes in water quality* –Operation of heavy equipment, removal of vegetation, and ground-disturbing activities within project footprints in close proximity to aquatic resources could result in changes to water quality in the action area through increased transportation of sediment or other contaminants as well as alterations to water temperature. Changes in water quality could result in acute and longer-term adverse effects to the PBFs of covered crustacean critical habitats. These effects would occur primarily during the construction phase due to ground disturbance, but could persist beyond construction. The effects will be minimized through application of conservation measures, including the development and implementation of plans for prompt and effective response to any accidental spills, and limiting refueling and maintenance of heavy equipment within 150 feet of aquatic habitat. Site restoration would minimize the duration of these effects. Other general and species-specific measures will be implemented to minimize construction activities near covered crustacean critical habitats and avoid work in the rainy season. Implementation of these measures would reduce potential exposure of covered crustacean critical habitats to changes in water quality.

- *Changes in air quality* – Project activities that involve the operation of heavy equipment, removal of vegetation, and other ground disturbing activities, like trenching or plowing, could result in changes in air quality by releasing dust and other particulate matter into the air. Changes in air quality could cause adverse effects such as degradation of the PBFs of covered crustacean critical habitats. These effects would be limited to the construction phase when the ground is disturbed and would be avoided and minimized by implementation of conservation measures. These measures will limit construction activities near covered crustacean critical habitat, which will reduce the potential for adverse effects due to changes in air quality.

- *Changes in hydrology* – Project activities that involve excavation adjacent to aquatic resources (e.g., trenching to install conduit) could result in changes to hydrology which could in turn affect covered crustacean critical habitats. Project activities associated with HDD, jack and drill, and at conduit and vault installation sites would generally result in limited adverse effects to covered crustacean critical habitats because these activities would be small in size, and because Caltrans will avoid critical habitats to the extent practicable. Changes in hydrology could include modification of the PBFs of covered crustacean critical habitats. These changes would be most pronounced in seasonal aquatic habitats but could also impact soil moisture levels in uplands. These consequences would be avoided and minimized by implementing conservation measures that will avoid installation of permanent infrastructure (i.e., vaults and network hubs) in covered crustacean critical habitats, restore and recontour topography to original grade, and establish avoidance buffers around covered crustacean critical habitat.

Vernal Pool Fairy Shrimp Critical Habitat

We expect that adverse effects to vernal pool fairy shrimp critical habitat could include: disturbance to soils or vegetation; increased erosion and sedimentation, including turbidity; changes in water quality; introduction of invasive plants; disturbance or removal of surface/subsurface refugia; changes in air quality; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could temporarily affect up to 153.54 acres of critical habitat for the vernal pool fairy shrimp, and permanently affect up to 0.64 acre. The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents 1.1 percent of 590,007 total acres of the critical habitat for vernal pool fairy shrimp. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of vernal pool fairy shrimp critical habitat.

Vernal Pool Tadpole Shrimp Critical Habitat

We expect that adverse effects to vernal pool tadpole shrimp critical habitat could include: disturbance to soils or vegetation; increased erosion and sedimentation, including turbidity; changes in water quality; introduction of invasive plants; disturbance or removal of surface/subsurface refugia; changes in air quality; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could temporarily affect up to 95.80 acres of critical habitat for the vernal pool tadpole shrimp, and permanently affect up to 0.4 acre. The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support

PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents 1.52 percent of 228,764 total acres of the critical habitat for vernal pool tadpole shrimp. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of vernal pool tadpole shrimp critical habitat.

Effects of the Action on Plants

Covered plants that occur within the action area could be adversely affected by project activities. Most areas that would be disturbed by project activities are in terrestrial upland habitats. Caltrans would avoid or minimize effects to covered plant species by implementing general conservation measures and plant-specific conservation measures. Implementing these measures would establish seasonal surveys and avoidance buffers, and minimize impacts near covered plant populations. Here we describe potential adverse effects to covered plants and covered plant critical habitats. We further list relevant effects for each covered plant and plant critical habitat in their respective subheading.

<u>Effects to Species</u>

We anticipate that adverse effects to covered plants could include the following:

- *Increased erosion and sedimentation* – Project activities that involve removal of vegetation and disturbance of soils, like trenching or plowing, could result in increased erosion and sedimentation after project sites containing covered plant species are exposed to rainfall events. This could cause adverse effects such as degradation of suitable habitat, and potentially uproot, damage, remove, or bury covered plants. These effects would be limited to the construction phase and would be minimized by implementation of conservation measures which limit potential for erosion and sedimentation in areas with suitable habitat for covered plant species. These conservation measures will also limit project activities during rain events and implement standard stormwater BMPs. Implementation of these measures would reduce the potential for adverse effects on covered plants species due to erosion and sedimentation.

- *Increase in temperature* – Project activities that involve removal of vegetation, like trenching or plowing, could result in increased temperatures in the microhabitats where covered plant species occur. This could cause adverse effects such as degradation of suitable habitat through a reduction in soil moisture, and result in changes in plant physiology including changes in evapotranspiration which leads to wilting. These consequences to local populations of covered plant species may extend beyond the construction phase until sites are restored to pre-project conditions, but given the small width of the project footprint (up to 20 feet wide), we do not expect project activities to result in significant changes to thermal profiles at the landscape level. Caltrans will implement conservation measures to reduce the potential for adverse effects on covered plant species due to increases in temperature by limiting impacts to known covered plant occurrences adjacent to the roadway and restoring project sites to pre-project conditions.

- *Changes in water quality* –Operation of heavy equipment, removal of vegetation, and ground-disturbing activities within project footprints in close proximity to aquatic resources could result in changes to water quality in the action area through increased transportation of sediment or other contaminants as well as alterations to water temperature. Changes in water quality could result in acute and longer-term health-based effects including changes in plant growth, and injury to plants through physiological changes. These effects would occur primarily during the construction phase due to ground disturbance, but could persist beyond construction. The effects will be minimized through application of the proposed conservation measures, including the development and implementation of plans for prompt and effective response to any accidental spills, and limiting refueling and maintenance of heavy equipment within 150 feet of aquatic habitat. Site restoration would minimize the duration of these effects. Other general and species-specific measures will be implemented to minimize construction activities near known covered plant populations and suitable habitat, and avoid work in covered plant habitats during the rainy season. The conservation measures additionally prohibit work within 250 feet of suitable aquatic habitats. Implementation of these measures would reduce potential exposure of covered plant species and their associated habitats to changes in water quality.

- *Changes in air quality* – Project activities that involve the operation of heavy equipment, removal of vegetation, and other ground disturbing activities, like trenching or plowing, could result in changes in air quality by releasing dust and other particulate matter into the air. Changes in air quality could cause adverse effects such as degradation of plant functions including physiological changes to, for example, photosynthesis, growth, and reproduction. These effects would be limited to the construction phase when the ground is disturbed and would be avoided and minimized by implementation of conservation measures. These measures will limit construction activities near known covered plant populations and suitable habitat, and reduce the potential for adverse effects on covered plant species due to changes in air quality.

- *Introduction of invasive competitors or disease* – Project activities may introduce invasive species or disease to work areas through contamination of equipment, vehicles, personnel, or materials such as soils used for backfilling. In addition, ground disturbing activities, including those that remove vegetation or alter the substrate, may lead to increased colonization by invasive species. Potential effects to covered plant species by invasive competitors or disease vary widely depending on the invasive species or disease. Competition or introduction of disease could result in the loss of individual plants due to the loss of resources needed for plant survival (e.g., sunlight or soil moisture), or population-level declines in reproductive fitness or health throughout the action area. These effects would be minimized by implementation of conservation measures that minimize and restore impacts near covered plant populations; implement BMPs to limit the introduction of invasive species on equipment, vehicles, personnel, and materials; and ensure good site keeping. These measures would reduce the potential adverse effects to covered plant species by minimizing the introduction of invasive species and disease.

- *Changes in hydrology* – Project activities that involve excavation adjacent to aquatic resources (e.g., trenching to install conduit) could result in changes to hydrology which could in turn affect covered plant species. Project activities associated with HDD, jack and drill, and at conduit and vault installation sites would generally result in low-intensity responses from covered plants because these activities would be cited in uplands, would be small in size, and because Caltrans will avoid suitable habitat for covered species to the extent practicable. Excavation would not occur within aquatic resources; however, excavation may occur adjacent to aquatic resources. In these instances, excavation could result in minor, localized changes in hydrology. Changes in hydrology could include modification of suitable terrestrial and aquatic habitats, including changes in inundation duration, water availability, and minor changes in flows. These changes would be most pronounced in seasonal aquatic habitats but could also impact soil moisture levels in uplands. Exposure to these changes would affect the survival of covered plant species by increasing stress or elicit physiological responses. These consequences would be avoided and minimized by implementing conservation measures that will avoid installation of permanent infrastructure (i.e., vaults, and network hubs) in suitable habitat, restore and recontour topography to original grade, and establish avoidance buffers around suitable habitats.

- *Direct disturbance to covered plant individuals* – Project related activities that result in ground disturbance could remove or crush above ground individuals of covered plant species, and their root systems, or their seeds located in the soil if project activities are not located on the roadway or other disturbed areas outside of covered species' suitable habitats. These effects would be minimized through implementation of the conservation measures as practicable, including design measures, which would avoid suitable habitat for covered plant species, and implement preconstruction or other surveys to identify and flag covered plants for avoidance.

- *Physical collection and relocation* – Implementation of relocation efforts during construction activities would result in covered plant individuals being collected and relocated into suitable habitat within the action area. The likelihood that relocation efforts will be successful for covered plant species is highly variable based on a multitude of factors (e.g., species life history and microhabitat conditions of relocation areas), and individuals could die as a result of relocation efforts. Covered plants that are exposed to adverse effects resulting from collection and relocation efforts would otherwise be subject to direct disturbance (e.g., removal of individuals) from the ground disturbing activities they are being relocated away from, and are thus considered a conservation measure to minimize the adverse effects of ground disturbing activities.

Baker's Larkspur

We expect that adverse effects to Baker's larkspur could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Baker's larkspur is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect individuals in approximately 21.88 acres of modeled habitat, any lost productivity is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Baker's larkspur individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We expect few individual plants will suffer from injury or mortality due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. For this reason, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 45.52 acres of modeled Baker's larkspur habitat and permanently affect up to 0.19 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 64,071 acres of suitable habitat for the Baker's larkspur throughout the species' range, of which 2,145 acres (3.35 percent) occur within the study area. Therefore, project activities may affect up to 0.071 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Baker's larkspur by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Baker's larkspur.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Baker's larkspur. Project activities would not increase the regional threats currently affecting Baker's larkspur as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

Beach Layia

We expect that adverse effects to beach layia could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where beach layia is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 4.38 acres of temporary impacts and 0.02 acre of permanent impacts to beach layia habitat. Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some beach layia individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely upon the 4.38 acres of suitable habitat that would be temporarily impacted and the 0.02 acres of suitable habitat that would be permanently impacted could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 4.38 acres of beach layia habitat and permanently affect up to 0.02 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 9,188 acres of suitable habitat for the beach layia throughout the species' range, of which 213 acres (2.314 percent) occur within the study area. Therefore, project activities may affect up to 0.048 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of beach layia by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of beach layia.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of beach layia. Project activities would not increase the regional threats currently affecting beach layia as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Ben Lomond Wallflower</u>

We expect that adverse effects to Ben Lomond wallflower could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Ben Lomond wallflower is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 0.69 acre of temporary impacts and 0.001 acre of permanent impacts to Ben Lomond wallflower habitat. Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Ben Lomond wallflower individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely upon the 0.69 acre of suitable habitat that would be temporarily impacted and the 0.001 acres of suitable habitat that would be permanently impacted could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 0.69 acres of Ben Lomond wallflower habitat and permanently affect up to 0.001 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 2,980 acres of suitable habitat for the Ben Lomond wallflower throughout the species' range, of which 34 acres (1.125 percent) occur within the study area. Therefore, project activities may affect up to 0.023 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Ben Lomond wallflower by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Ben Lomond wallflower.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Ben Lomond wallflower. Project activities would not increase the regional threats currently affecting Ben Lomond wallflower as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

Butte County Meadowfoam

We expect that adverse effects to Butte County meadowfoam could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Butte County meadowfoam is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 5 acres of impacts to Butte County meadowfoam habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Butte County meadowfoam individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 5 acres of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 5 acres of Butte County meadowfoam habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 71,675 acres of suitable habitat for the Butte County meadowfoam throughout the species' range, of which 2,249 acres (3.14 percent) occur within the study area. Therefore, project activities may permanently affect up to 0.014 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Butte County meadowfoam by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Butte County meadowfoam.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Butte County meadowfoam. Project activities would not increase the regional threats currently affecting Butte County meadowfoam as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>California Orcutt Grass</u>

We expect that adverse effects to California Orcutt grass could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where California Orcutt grass is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 1 acre of impacts to California Orcutt grass habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some California Orcutt grass individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 1 acre of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 1 acre of California Orcutt grass habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 143,604 acres of suitable habitat for the California Orcutt grass throughout the species' range, of which 3,201 acres (2.23 percent) occur within the study area. Therefore, project activities may permanently affect less than 0.001 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of California Orcutt grass by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of California Orcutt grass.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of California Orcutt grass. Project activities would not increase the regional threats currently affecting California Orcutt grass as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Chorro Creek Bog Thistle</u>

We expect that adverse effects to Chorro Creek bog thistle could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Chorro Creek bog thistle is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 1 acre of impacts to Chorro Creek bog thistle habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Chorro Creek bog thistle individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 1 acre of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 1 acre of Chorro Creek bog thistle habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 504,121 acres of suitable habitat for the Chorro Creek bog thistle throughout the species' range, of which 3,726 acres (0.84 percent) occur within the study area. Therefore, project activities may permanently affect less than 0.001 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Chorro Creek bog thistle by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Chorro Creek bog thistle.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Chorro Creek bog thistle. Project activities would not increase the regional threats currently affecting Chorro Creek bog thistle as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Coachella Valley Milk-Vetch</u>

We expect that adverse effects to Coachella Valley milk-vetch could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Coachella Valley milk-vetch is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 38.56 acres of temporary impacts and 0.16 acre of permanent impacts to Coachella Valley milk-vetch habitat. Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Coachella Valley milk-vetch individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely upon the 38.56 acres of suitable habitat that would be temporarily impacted and the 0.16 acres of suitable habitat that would be permanently impacted could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 38.56 acres of Coachella Valley milk-vetch habitat and permanently affect up to 0.16 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 117,046 acres of suitable habitat for the Coachella Valley milk-vetch throughout the species' range, of which 1,921 acres (1.64 percent) occur within the study area. Therefore, project activities may affect up to 0.033 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Coachella Valley milk-vetch by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Coachella Valley milk-vetch.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Coachella Valley milk-vetch. Project activities would not increase the regional threats currently affecting Coachella Valley milk-vetch as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Colusa Grass</u>

We expect that adverse effects to Colusa grass could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to

individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Colusa grass is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 5 acres of impacts to Colusa grass habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Colusa grass individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 5 acres of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 5 acres of Colusa grass habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 320,186 acres of suitable habitat for the Colusa grass throughout the species' range, of which 1,020 acres (0.32 percent) occur within the study area. Therefore, project activities may permanently affect up to 0.002 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Colusa grass by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Colusa grass.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Colusa grass. Project activities would not increase the regional threats currently affecting Colusa grass as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

Contra Costa Goldfields

We expect that adverse effects to Contra Costa goldfields could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Contra Costa goldfields is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 25 acres of impacts to Contra Costa goldfields habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Contra Costa goldfields individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 25 acres of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 25 acres of Contra Costa goldfields habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 480,618 acres of suitable habitat for the Contra Costa goldfields throughout the species' range, of which 12,439 acres (2.59 percent) occur within the study area. Therefore, project activities may permanently affect up to 0.005 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Contra Costa goldfields by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Contra Costa goldfields.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Contra Costa goldfields. Project activities would not increase the regional threats currently affecting Contra Costa goldfields as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Cushenbury Buckwheat</u>

We expect that adverse effects to Cushenbury buckwheat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Cushenbury buckwheat is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 21.88 acres of temporary impacts and 0.09 acre of permanent impacts to Cushenbury buckwheat habitat. Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Cushenbury buckwheat individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely upon the 21.88 acres of suitable habitat that would be temporarily impacted and the 0.09 acre of suitable habitat that would be permanently impacted could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 21.88 acres of modeled Cushenbury buckwheat habitat and permanently affect up to 0.09 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 90,844 acres of suitable habitat for the Cushenbury buckwheat throughout the species' range, of which 1,070 acres (1.18 percent) occur within the study area. Therefore, project activities may affect up to 0.024 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Cushenbury buckwheat by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Cushenbury buckwheat.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Cushenbury buckwheat. Project activities would not increase the regional threats currently affecting Cushenbury buckwheat as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

Few-flowered Navarretia

We expect that adverse effects to few-flowered navarretia could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where few-flowered navarretia is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 5 acres of impacts to few-flowered navarretia habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species'

reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some few-flowered navarretia individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 5 acres of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 5 acres of few-flowered navarretia habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 19,391 acres of suitable habitat for the few-flowered navarretia throughout the species' range, of which 742 acres (3.83 percent) occur within the study area. Therefore, project activities may permanently affect up to 0.026 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of few-flowered navarretia by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of few-flowered navarretia.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of few-flowered navarretia. Project activities would not increase the regional threats currently affecting few-flowered navarretia as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Fleshy Owl's Clover</u>

We expect that adverse effects to fleshy owl's clover could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality;

introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where fleshy owl's clover is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 5 acres of impacts to fleshy owl's clover habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some fleshy owl's clover individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 5 acres of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 5 acres of fleshy owl's clover habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 492,060 acres of suitable habitat for the fleshy owl's clover throughout the species' range, of which 4,125 acres (0.84 percent) occur within the study area. Therefore, project activities may permanently affect up to 0.001 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of fleshy owl's clover by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of fleshy owl's clover.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of fleshy owl's clover. Project activities would not increase the regional threats currently affecting fleshy owl's clover as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Gentner's Fritillary</u>

We expect that adverse effects to Gentner's fritillary could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Gentner's fritillary is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect individuals in approximately 19.85 acres of modeled habitat, any lost productivity is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Gentner's fritillary individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We expect few individual plants will suffer from injury or mortality due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. For this reason, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 19.85 acres of modeled Gentner's fritillary habitat and permanently affect up to 0.08 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 43,211 acres of suitable habitat for the Gentner's fritillary throughout the species' range, of which 993 acres (2.3 percent) occur within the study area. Therefore, project activities may affect up to 0.046 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Gentner's fritillary by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Gentner's fritillary.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Gentner's fritillary. Project activities would not increase the regional threats currently affecting Gentner's fritillary as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Greene's Tuctoria</u>

We expect that adverse effects to Greene's tuctoria could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Greene's tuctoria is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 5 acres of impacts to Greene's tuctoria habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Greene's tuctoria individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 5 acres of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 5 acres of Greene's tuctoria habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 315,815 acres of suitable habitat for the Greene's tuctoria throughout the species' range, of which 3,374 acres (1.07 percent) occur within the study area. Therefore, project activities may permanently affect up to 0.002 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Greene's tuctoria by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Greene's tuctoria.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Greene's tuctoria. Project activities would not increase the regional threats currently affecting Greene's tuctoria as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Hairy Orcutt Grass</u>

We expect that adverse effects to hairy Orcutt grass could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where hairy Orcutt grass is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 5 acres of impacts to hairy Orcutt grass habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some hairy Orcutt grass individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 5 acres of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 5 acres of hairy Orcutt grass habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 240,854 acres of suitable habitat for the hairy Orcutt grass throughout the species' range, of which 2,678 acres (1.11 percent) occur within the study area. Therefore, project activities may permanently affect up to 0.002 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of hairy Orcutt grass by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of hairy Orcutt grass.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of hairy Orcutt grass. Project activities would not increase the regional threats currently affecting hairy Orcutt grass as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Hoover's Spurge</u>

We expect that adverse effects to Hoover's spurge could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to

individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Hoover's spurge is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 5 acres of impacts to Hoover's spurge habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Hoover's spurge individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 5 acres of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 5 acres of Hoover's spurge habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 147,845 acres of suitable habitat for the Hoover's spurge throughout the species' range, of which 1,886 acres (1.28 percent) occur within the study area. Therefore, project activities may permanently affect up to 0.003 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Hoover's spurge by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Hoover's spurge.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Hoover's spurge. Project activities would not increase the regional threats currently affecting Hoover's spurge as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Howell's Spineflower</u>

We expect that adverse effects to Howell's spineflower could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Howell's spineflower is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect individuals in approximately 2.63 acres of modeled habitat, any lost productivity is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Howell's spineflower individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We expect few individual plants will suffer from injury or mortality due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. For this reason, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 2.63 acres of modeled Howell's spineflower habitat and permanently affect up to 0.01 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 1,285 acres of suitable habitat for the Howell's spineflower throughout the species' range, of which 133 acres (10.34 percent) occur within the study area. Therefore, project activities may affect up to 0.2 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Howell's spineflower by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Howell's spineflower.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Howell's spineflower. Project activities would not increase the regional threats currently affecting Howell's spineflower as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Ione Buckwheat</u>

We expect that adverse effects to Ione buckwheat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Ione buckwheat is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect individuals in approximately 2.1 acres of modeled habitat, any lost productivity is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Ione buckwheat individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We expect few individual plants will suffer from injury or mortality due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. For this reason, we

expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 2.1 acres of modeled Ione buckwheat habitat and permanently affect up to 0.1 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 5,549 acres of suitable habitat for the Ione buckwheat throughout the species' range, of which 103 acres (1.86 percent) occur within the study area. Therefore, project activities may affect up to 0.038 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Ione buckwheat by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Ione buckwheat.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Ione buckwheat. Project activities would not increase the regional threats currently affecting Ione buckwheat as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Ione Manzanita</u>

We expect that adverse effects to Ione manzanita could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Ione manzanita is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect individuals in approximately 43.37 acres of modeled habitat, any lost productivity is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Ione manzanita individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We expect few individual plants will suffer from injury or mortality due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. For this reason, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 43.37 acres of modeled Ione manzanita habitat and permanently affect up to 0.18 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 67,516 acres of suitable habitat for the Ione manzanita throughout the species' range, of which 2,140 acres (3.17 percent) occur within the study area. Therefore, project activities may affect up to 0.064 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Ione manzanita by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Ione manzanita.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Ione manzanita. Project activities would not increase the regional threats currently affecting Ione manzanita as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Kern Mallow</u>

We expect that adverse effects to Kern mallow could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality;

introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Kern mallow is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect individuals in approximately 89.45 acres of modeled habitat, any lost productivity is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Kern mallow individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We expect few individual plants will suffer from injury or mortality due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. For this reason, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 89.45 acres of modeled Kern mallow habitat and permanently affect up to 0.37 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 313,374 acres of suitable habitat for the Kern mallow throughout the species' range, of which 4,408 acres (2.43 percent) occur within the study area. Therefore, project activities may affect up to 0.029 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Kern mallow by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Kern mallow.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Kern mallow. Project activities would not increase the regional threats currently affecting Kern mallow described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Layne's Butterweed</u>

We expect that adverse effects to Layne's butterweed could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Layne's butterweed is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect individuals in approximately 38.63 acres of modeled habitat, any lost productivity is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Layne's butterweed individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We expect few individual plants will suffer from injury or mortality due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. For this reason, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 38.63 acres of modeled Layne's butterweed habitat and permanently affect up to 0.16 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 89,971 acres of suitable habitat for the Layne's butterweed throughout the species' range, of which 1,886 acres (2.1 percent) occur within the study area. Therefore, project activities may affect up to 0.043 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Layne's butterweed by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Layne's butterweed.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Layne's butterweed. Project activities would not increase the regional threats currently affecting Layne's butterweed as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

Loch Lomond Coyote Thistle

We expect that adverse effects to Loch Lomond coyote thistle could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Loch Lomond coyote thistle is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 1 acre of impacts to Loch Lomond coyote thistle habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Loch Lomond coyote thistle individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 1 acre of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 1 acre of Loch Lomond coyote thistle habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 4,800 acres of suitable habitat for the Loch Lomond coyote thistle throughout the species' range, of which 316 acres (6.58 percent) occur within the study area. Therefore, project activities may permanently affect up to 0.021 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Loch Lomond coyote thistle by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Loch Lomond coyote thistle.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Loch Lomond coyote thistle. Project activities would not increase the regional threats currently affecting Loch Lomond coyote thistle as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Many-flowered Navarretia</u>

We expect that adverse effects to many-flowered navarretia could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where many-flowered navarretia is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 1 acre of impacts to many-flowered navarretia habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some many-flowered navarretia individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 1 acre of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 1 acre of many-flowered navarretia habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 22,193 acres of suitable habitat for the many-flowered navarretia throughout the species' range, of which 742 acres (3.84 percent) occur within the study area. Therefore, project activities may permanently affect up to 0.005 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of many-flowered navarretia by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of many-flowered navarretia.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of many-flowered navarretia. Project activities would not increase the regional threats currently affecting many-flowered navarretia as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Menzie's Wallflower</u>

We expect that adverse effects to Menzie's wallflower could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to

individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Menzie's wallflower is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect individuals in approximately 3.76 acres of modeled habitat, any lost productivity is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Menzie's wallflower individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We expect few individual plants will suffer from injury or mortality due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. For this reason, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 3.76 acres of modeled Menzie's wallflower habitat and permanently affect up to 0.02 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 1,771 acres of suitable habitat for the Menzie's wallflower throughout the species' range, of which 227 acres (12.81 percent) occur within the study area. Therefore, project activities may affect up to 0.212 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Menzie's wallflower by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Menzie's wallflower.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Menzie's wallflower. Project activities would not increase the regional threats currently affecting Menzie's wallflower as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

Monterey Spineflower

We expect that adverse effects to Monterey spineflower could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Monterey spineflower is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect individuals in approximately 38.80 acres of modeled habitat, any lost productivity is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Monterey spineflower individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We expect few individual plants will suffer from injury or mortality due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. For this reason, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 38.80 acres of modeled Monterey spineflower habitat and permanently affect up to 0.16 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 132,637 acres of suitable habitat for the Monterey spineflower throughout the species' range, of which 1,931 acres (1.46 percent) occur within the study area. Therefore, project activities may affect up to 0.029 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Monterey spineflower by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Monterey spineflower.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Monterey spineflower. Project activities would not increase the regional threats currently affecting Monterey spineflower as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

Nipomo Mesa Lupine

We expect that adverse effects to Nipomo Mesa lupine could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Nipomo Mesa lupine is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect individuals in approximately 0.43 acre of modeled habitat, any lost productivity is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Nipomo Mesa lupine individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We expect few individual plants will suffer from injury or mortality due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. For this reason, we

expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 0.43 acre of modeled Nipomo Mesa lupine habitat and permanently affect up to 0.01 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 1,056 acres of suitable habitat for the Nipomo Mesa lupine throughout the species' range, of which 39 acres (3.72 percent) occur within the study area. Therefore, project activities may affect up to 0.041 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Nipomo Mesa lupine by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Nipomo Mesa lupine.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Nipomo Mesa lupine. Project activities would not increase the regional threats currently affecting Nipomo Mesa lupine as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Palmate-bracted Bird's Beak</u>

We expect that adverse effects to palmate-bracted bird's beak could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where palmate-bracted bird's beak is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 5 acres of impacts to palmate-bracted bird's beak habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species'

reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some palmate-bracted bird's beak individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 5 acres of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 5 acres of palmate-bracted bird's beak habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 84,738 acres of suitable habitat for the palmate-bracted bird's beak throughout the species' range, of which 1,016 acres (1.2 percent) occur within the study area. Therefore, project activities may permanently affect up to 0.006 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of palmate-bracted bird's beak by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of palmate-bracted bird's beak.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of palmate-bracted bird's beak. Project activities would not increase the regional threats currently affecting palmate-bracted bird's beak as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Parish's Daisy</u>

We expect that adverse effects to Parish's daisy could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality;

introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects on are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Parish’s daisy is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect individuals in approximately 30.21 acres of modeled habitat, any lost productivity is not likely to affect the species’ reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans’ proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Parish’s daisy individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We expect few individual plants will suffer from injury or mortality due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. For this reason, we expect that the proposed action would not measurably reduce the species’ numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 30.21 acres of modeled Parish’s daisy habitat and permanently affect up to 0.13 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 208,471 acres of suitable habitat for the Parish’s daisy throughout the species’ range, of which 1,492 acres (0.72 percent) occur within the study area. Therefore, project activities may affect up to 0.014 percent of the species’ rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service’s policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Parish’s daisy by restoring, enhancing, or preserving habitat elsewhere in the species’ range.

Due to the very small amount of habitat impacts and Caltrans’ commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Parish’s daisy.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Parish's daisy. Project activities would not increase the regional threats currently affecting Parish's daisy as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

Pedate Checker-mallow

We expect that adverse effects to pedate checker-mallow could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where pedate checker-mallow is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect individuals in approximately 1.02 acres of modeled habitat, any lost productivity is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some pedate checker-mallow individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We expect few individual plants will suffer from injury or mortality due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. For this reason, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 1.02 acres of modeled pedate checker-mallow habitat and permanently affect up to 0.01 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 413 acres of suitable habitat for the pedate checker-mallow throughout the species' range, of which 50 acres (12.14 percent) occur within the study area. Therefore, project activities may affect up to 0.25 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of pedate checker-mallow by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of pedate checker-mallow.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of pedate checker-mallow. Project activities would not increase the regional threats currently affecting pedate checker-mallow as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

Pine Hill Ceanothus

We expect that adverse effects to Pine Hill ceanothus could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Pine Hill ceanothus is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect individuals in approximately 2.83 acres of modeled habitat, any lost productivity is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Pine Hill ceanothus individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We expect few individual plants will suffer from injury or mortality due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. For this reason, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 2.83 acres of modeled Pine Hill ceanothus habitat and permanently affect up to 0.01 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 16,611 acres of suitable habitat for the Pine Hill ceanothus throughout the species' range, of which 141 acres (0.85 percent) occur within the study area. Therefore, project activities may affect up to 0.017 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Pine Hill ceanothus by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Pine Hill ceanothus.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Pine Hill ceanothus. Project activities would not increase the regional threats currently affecting Pine Hill ceanothus as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Pismo Clarkia</u>

We expect that adverse effects to Pismo clarkia could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Pismo clarkia is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect individuals in approximately 906.87 acres of modeled habitat, any lost productivity is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Pismo clarkia individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We expect few individual plants will suffer from injury or mortality due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. For this reason, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 906.87 acres of modeled Pismo clarkia habitat and permanently affect up to 3.75 acres, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 285,945 acres of suitable habitat for the Pismo clarkia throughout the species' range, of which 2,017 acres (0.71 percent) occur within the study area. Therefore, project activities may affect up to 0.014 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Pismo clarkia by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Pismo clarkia.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Pismo clarkia. Project activities would not increase the regional threats currently affecting Pismo clarkia as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Sacramento Orcutt Grass</u>

We expect that adverse effects to Sacramento Orcutt grass could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to

individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Sacramento Orcutt grass is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 1 acre of impacts to Sacramento Orcutt grass habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Sacramento Orcutt grass individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 1 acre of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 1 acre of Sacramento Orcutt grass habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 90,811 acres of suitable habitat for the Sacramento Orcutt grass throughout the species' range, of which 1,004 acres (1.11 percent) occur within the study area. Therefore, project activities may permanently affect up to 0.001 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Sacramento Orcutt grass by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Sacramento Orcutt grass.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Sacramento Orcutt grass. Project activities would not increase the regional threats currently affecting Sacramento Orcutt grass as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

San Bernardino Bluegrass

We expect that adverse effects to San Bernardino bluegrass could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where San Bernardino bluegrass is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 1 acre of impacts to San Bernardino bluegrass habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some San Bernardino bluegrass individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 1 acre of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 1 acre of San Bernardino bluegrass habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 1,039 acres of suitable habitat for the San Bernardino bluegrass throughout the species' range, of which 50 acres (4.82 percent) occur within the study area. Therefore, project activities may permanently affect up to 0.01 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of San Bernardino bluegrass by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of San Bernardino bluegrass.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of San Bernardino bluegrass. Project activities would not increase the regional threats currently affecting San Bernardino bluegrass as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>San Diego Ambrosia</u>

We expect that adverse effects to San Diego ambrosia could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where San Diego ambrosia is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect individuals in approximately 41.48 acres of modeled habitat, any lost productivity is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some San Diego ambrosia individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We expect few individual plants will suffer from injury or mortality due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. For this reason, we

expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 41.48 acres of modeled San Diego ambrosia habitat and permanently affect up to 0.17 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 119,920 acres of suitable habitat for the San Diego ambrosia throughout the species' range, of which 2,067 acres (1.72 percent) occur within the study area. Therefore, project activities may affect up to 0.035 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of San Diego ambrosia by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of San Diego ambrosia.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of San Diego ambrosia. Project activities would not increase the regional threats currently affecting San Diego ambrosia as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>San Diego Button-Celery</u>

We expect that adverse effects to San Diego button-celery could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where San Diego button-celery is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 1 acre of impacts to San Diego button-celery habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species'

reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some San Diego button-celery individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 1 acre of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 1 acre of San Diego button-celery habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 134,603 acres of suitable habitat for the San Diego button-celery throughout the species' range, of which 1,375 acres (1.02 percent) occur within the study area. Therefore, project activities may permanently affect less than 0.001 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of San Diego button-celery by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of San Diego button-celery.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of San Diego button-celery. Project activities would not increase the regional threats currently affecting San Diego button-celery as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

San Diego Mesa-Mint

We expect that adverse effects to San Diego mesa-mint could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where San Diego mesa-mint is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 1 acre of impacts to San Diego mesa-mint habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some San Diego mesa-mint individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 1 acre of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 1 acre of San Diego mesa-mint habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 27,620 acres of suitable habitat for the San Diego mesa-mint throughout the species' range, of which 537 acres (1.95 percent) occur within the study area. Therefore, project activities may permanently affect up to 0.004 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of San Diego mesa-mint by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of San Diego mesa-mint.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential San Diego mesa-mint. Project activities would not increase the regional threats currently affecting San Diego mesa-mint as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>San Jacinto Valley Crownscale</u>

We expect that adverse effects to San Jacinto Valley crownscale could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where San Jacinto Valley crownscale is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 1 acre of impacts to San Jacinto Valley crownscale habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some San Jacinto Valley crownscale individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 1 acre of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 1 acre of San Jacinto Valley crownscale habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 21,162 acres of suitable habitat for the San Jacinto Valley crownscale throughout the species' range, of which 360 acres (1.70 percent) occur within the study area. Therefore, project activities may permanently affect less than 0.001 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of San Jacinto Valley crownscale by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of San Jacinto Valley crownscale.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of San Jacinto Valley crownscale. Project activities would not increase the regional threats currently affecting San Jacinto Valley crownscale as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>San Joaquin Orcutt Grass</u>

We expect that adverse effects to San Joaquin Orcutt grass could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where San Joaquin Orcutt grass is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 5 acres of impacts to San Joaquin Orcutt grass habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some San Joaquin Orcutt grass individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 5 acres of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 5 acres of San Joaquin Orcutt grass habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 313,205 acres of suitable habitat for the San Joaquin Orcutt grass throughout the species' range, of which 2,268 acres (0.72 percent) occur within the study area. Therefore, project activities may permanently affect up to 0.002 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of San Joaquin Orcutt grass by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of San Joaquin Orcutt grass.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of San Joaquin Orcutt grass. Project activities would not increase the regional threats currently affecting San Joaquin Orcutt grass as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>San Joaquin Wooly-Threads</u>

We expect that adverse effects to San Joaquin wooly-threads could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where San Joaquin wooly-threads is present. These local changes may temporarily result in decreased reproductive success from a small number of individuals that are exposed to the changes. Although we expect that project activities could affect individuals in approximately 141.03 acres of modeled habitat, any lost productivity is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some San Joaquin wooly-threads individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We expect few individual plants will suffer from injury or mortality due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects of project activities. For this reason, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 141.03 acres of modeled San Joaquin wooly-threads habitat and permanently affect up to 0.58 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 906,842 acres of suitable habitat for the San Joaquin wooly-threads throughout the species' range, of which 7,107 acres (0.78 percent) occur within the study area. Therefore, project activities may affect up to 0.016 percent of the species' rangewide habitat temporarily, and 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of San Joaquin wooly-threads by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of San Joaquin wooly-threads.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of San Joaquin wooly-threads. Project activities would not increase the regional threats currently affecting San

Joaquin wooly-threads as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

Santa Clara Valley Dudleya

We expect that adverse effects to Santa Clara Valley dudleya could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Santa Clara Valley dudleya is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 17.15 acres of temporary impacts and 0.07 acre of permanent impacts to Santa Clara Valley dudleya habitat. Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Santa Clara Valley dudleya individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely upon the 17.15 acres of suitable habitat that would be temporarily impacted and the 0.07 acre of suitable habitat that would be permanently impacted could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 17.15 acres of Santa Clara Valley dudleya habitat and permanently affect up to 0.07 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 93,683 acres of suitable habitat for the Santa Clara Valley dudleya throughout the species' range, of which 860 acres (0.92 percent) occur within the study area. Therefore, project activities may affect up to 0.018 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Santa Clara Valley dudleya by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Santa Clara Valley dudleya.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Santa Clara Valley dudleya. Project activities would not increase the regional threats currently affecting Santa Clara Valley dudleya as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Santa Monica Mountains Dudleya</u>

We expect that adverse effects to Santa Monica Mountains dudleya could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Santa Monica Mountains dudleya is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 7.54 acres of temporary impacts and 0.03 acre of permanent impacts to Santa Monica Mountains dudleya habitat. Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Santa Monica Mountains dudleya individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely upon the 7.54 acres of suitable habitat that would be temporarily impacted and the 0.03 acre of suitable habitat that would be permanently impacted could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 7.54 acres of Santa Monica Mountains dudleya habitat and permanently affect up to 0.03 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 64,980 acres of suitable habitat for the Santa Monica Mountains dudleya throughout the species' range, of which 374 acres (0.58 percent) occur within the study area. Therefore, project activities may affect up to 0.012 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Santa Monica Mountains dudleya by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Santa Monica Mountains dudleya.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Santa Monica Mountains dudleya. Project activities would not increase the regional threats currently affecting Santa Monica Mountains dudleya as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Slender Orcutt Grass</u>

We expect that adverse effects to slender Orcutt grass could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where slender Orcutt grass is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 5 acres of impacts to slender Orcutt grass habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some slender Orcutt grass individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 5 acres of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 5 acres of slender Orcutt grass habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 408,256 acres of suitable habitat for the slender Orcutt grass throughout the species' range, of which 5,189 acres (1.27 percent) occur within the study area. Therefore, project activities may permanently affect up to 0.001 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of slender Orcutt grass by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of slender Orcutt grass.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of slender Orcutt grass. Project activities would not increase the regional threats currently affecting slender Orcutt grass as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

Spreading Navarretia

We expect that adverse effects to spreading navarretia could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where spreading navarretia is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 1 acre of impacts to spreading navarretia habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some spreading navarretia individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 1 acre of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 1 acre of spreading navarretia habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 1,070,190 acres of suitable habitat for the spreading navarretia throughout the species' range, of which 12,700 acres (1.19 percent) occur within the study area. Therefore, project activities may permanently affect less than 0.001 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of spreading navarretia by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of spreading navarretia.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of spreading navarretia. Project activities would not increase the regional threats currently affecting spreading navarretia as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

Stebbins' Morning-Glory

We expect that adverse effects to Stebbins' morning-glory could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where Stebbins' morning-glory is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 2.5 acres of temporary impacts and 0.01 acre of permanent impacts to Stebbins' morning-glory habitat. Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season). Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some Stebbins' morning-glory individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely upon the 2.5 acres of suitable habitat that would be temporarily impacted and the 0.01 acres of suitable habitat that would be permanently impacted could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could temporarily affect up to 2.5 acres of Stebbins' morning-glory habitat and permanently affect up to 0.01 acre, as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 17,980 acres of suitable habitat for the Stebbins' morning-glory throughout the species' range, of which 124 acres (0.69 percent) occur within the study area. Therefore, project activities may affect up to 0.014 percent of the species' rangewide habitat temporarily, and less than 0.001 percent permanently.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of Stebbins' morning-glory by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the very small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of Stebbins' morning-glory.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of Stebbins' morning-glory. Project activities would not increase the regional threats currently affecting Stebbins' morning-glory as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

<u>Thread-leaved Brodiaea</u>

We expect that adverse effects to thread-leaved brodiaea could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; changes in hydrology; direct disturbance to individuals; and physical collection or relocation. The result of these effects are described at the beginning of this section.

Reproduction

Project activities may temporarily change local environments where thread-leaved brodiaea is present. These local changes may temporarily result in decreased reproductive success from some or all individuals that are exposed to the changes. Caltrans would limit effects of project activities to no more than 5 acres of impacts to thread-leaved brodiaea habitat (see Table 7). Any lost productivity from affected individuals in these areas is not likely to affect the species' reproductive capacity overall because effects are primarily temporary and of a short duration (i.e., project activities will not occur in a local area for longer than one flowering season).

Furthermore, Caltrans' proposed compensation measures would promote reproduction through the restoration and enhancement of suitable habitat.

Numbers

Some thread-leaved brodiaea individuals may be injured or die because of project activities or during collection and relocation if they are covered, crushed, or otherwise exposed to the adverse effects described at the beginning of this section. We anticipate all individuals that rely on up to 5 acres of suitable habitat could be injured or killed; however, due to the nature of project activities and the conservation measures that Caltrans will implement to avoid and minimize effects to individual plants during project activities, we expect that the proposed action would not measurably reduce the species' numbers locally or range wide.

Distribution

Project activities could permanently affect up to 5 acres of thread-leaved brodiaea habitat as described in Chapter 4 of the PBA (Caltrans 2023). According to the habitat suitability model created by Caltrans (see Table 18), there are up to 279,258 acres of suitable habitat for the thread-leaved brodiaea throughout the species' range, of which 3,681 acres (1.32 percent) occur within the study area. Therefore, project activities may permanently affect up to 0.002 percent of the species' rangewide habitat.

Caltrans will offset temporary and permanent impacts to habitat through compensatory mitigation that meets the Service's policy of no net loss. Where compensation occurs on-site (e.g., through restoration) it will maintain habitat within the action area. Where compensation occurs off-site, it will help maintain or increase the distribution of thread-leaved brodiaea by restoring, enhancing, or preserving habitat elsewhere in the species' range.

Due to the small amount of habitat impacts and Caltrans' commitment to compensate those impacts, we do not anticipate that the proposed action will reduce the rangewide distribution of thread-leaved brodiaea.

Recovery

We do not anticipate that the proposed action will diminish the recovery potential of thread-leaved brodiaea. Project activities would not increase the regional threats currently affecting thread-leaved brodiaea as described in Appendix A, nor preclude the Service's ability to implement recovery actions.

Effects to Critical Habitats

We anticipate that project activities could result in adverse effects to covered plant critical habitats, including:

- *Disturbance to soils or vegetation* – Project activities that disturb soils or vegetation could result in the physical loss of critical habitat or adverse effects to PBFs. Caltrans would avoid or minimize these effects by implementing conservation measures, including design measures to ensure that permanent facilities such as vaults and maintenance vehicle pullouts are not located in areas with PBFs, and that all temporary impacts to areas with PBFs are either avoided or, if avoidance is not possible, mitigated for.

- *Increased erosion and sedimentation* – Project activities that involve removal of vegetation and disturbance of soils, like trenching or plowing, could result in increased erosion and sedimentation after project sites containing covered plant critical habitats are exposed to rainfall events. This could cause adverse effects to the PBFs of covered plant critical habitats through degradation of habitats that support the PBFs. These effects would be limited to the construction phase and would be minimized by implementation of conservation measures which limit potential for erosion and sedimentation in areas with critical habitat for covered plant species. These conservation measures will also limit project activities during rain events and implement standard stormwater BMPs. These measures would reduce the potential for adverse effects to covered plant critical habitats due to erosion and sedimentation.

- *Increase in temperature* – Project activities that involve removal of vegetation, like trenching or plowing, could result in increased temperatures in microhabitats that support the PBFs of covered plant critical habitats. This could cause adverse effects to covered plant critical habitats through degradation of PBFs (e.g., through a reduction in soil moisture, as applicable to the PBFs of covered plant critical habitats). These consequences may extend beyond the construction phase until sites are restored to pre-project conditions, but given the small width of the project footprint (up to 20 feet wide), we do not expect project activities to result in significant changes to the PBFs of entire covered plant critical habitat designations. Caltrans will implement conservation measures to reduce the potential for adverse effects on covered plant critical habtiats due to increases in temperature by limiting impacts to critical habitats adjacent to the roadway and restoring project sites to pre-project conditions.

- *Changes in water quality* –Operation of heavy equipment, removal of vegetation, and ground-disturbing activities within project footprints in close proximity to aquatic resources could result in changes to water quality in covered critical habitat through increased transportation of sediment or other contaminants as well as alterations to water temperature. Changes in water quality could result in acute and longer-term adverse effects to the PBFs of covered plant critical habitats. These effects would occur primarily during the construction phase due to ground disturbance, but could persist beyond construction. The effects will be minimized through application of conservation measures, including the development and implementation of plans for prompt and effective response to any accidental spills, and limiting refueling and maintenance of heavy equipment within 150 feet of aquatic habitat. Site restoration would minimize the duration of these effects. Other general and species-specific measures will be implemented to minimize construction activities near covered plant critical habitats and avoid work in the rainy season. Implementation of these measures would reduce potential exposure of covered plant critical habitats to changes in water quality.

- *Changes in air quality* – Project activities that involve the operation of heavy equipment, removal of vegetation, and other ground disturbing activities, like trenching or plowing, could result in changes in air quality by releasing dust and other particulate matter into the air. Changes in air quality could cause adverse effects such as degradation of the PBFs of covered plant critical habitats. These effects would be limited to the construction phase when the ground is disturbed and would be avoided and minimized by implementation of conservation measures. These measures will limit construction activities near covered plant critical habitat, which will reduce the potential for adverse effects on covered plant critical habitat due to changes in air quality.

- *Introduction of invasive competitors or disease* – Project activities may introduce invasive species or disease to work areas through contamination of equipment, vehicles, personnel, or materials such as soils used for backfilling. In addition, ground disturbing activities, including those that remove vegetation or alter the substrate, may lead to increased colonization by invasive species. Potential effects to covered plant critical habitats by invasive competitors or disease vary widely depending on the invasive species or disease. Competition or introduction of disease could result in the degradation of the PBFs of covered plant critical habitats by decreasing the resources needed to support the PBFs. These effects would be minimized by implementation of conservation measures that minimize and restore impacts near covered plant critical habitats; implement BMPs to limit the introduction of invasive species on equipment, vehicles, personnel, and materials; and ensure good site keeping. These measures would reduce the potential adverse effects to covered plant critical habitats by minimizing the introduction of invasive species and disease.

- *Changes in hydrology* – Project activities that involve excavation adjacent to aquatic resources (e.g., trenching to install conduit) could result in changes to hydrology which could in turn affect covered plant critical habitats. Project activities associated with HDD, jack and drill, and at conduit and vault installation sites would generally result in limited adverse effects to covered plant critical habitats because these activities would be small in size, and because Caltrans will avoid critical habitats to the extent practicable. Changes in hydrology could include modification of the PBFs of covered plant critical habitats. These changes would be most pronounced in seasonal aquatic habitats but could also impact soil moisture levels in uplands. These consequences would be avoided and minimized by implementing conservation measures that will avoid installation of permanent infrastructure (i.e., vaults, and network hubs) in covered plant critical habitats, restore and recontour topography to original grade, and establish avoidance buffers around covered plant critical habitat.

Ash-grey Paintbrush Critical Habitat

We expect that adverse effects to Ash-grey paintbrush critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 4.39 acres temporarily and 0.02 acre permanently of critical habitat for the Ash-grey paintbrush (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 4.23 percent of 1,768 total acres of the critical habitat for Ash-grey paintbrush. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Ash-grey paintbrush critical habitat.

Bear Valley Sandwort Critical Habitat

We expect that adverse effects to Bear Valley sandwort critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 2.74 acres temporarily and 0.01 acre permanently of critical habitat for the Bear Valley sandwort (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 3.72 percent of 1,412 total acres of the critical habitat for Bear Valley sandwort. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Bear Valley sandwort critical habitat.

Butte County Meadowfoam Critical Habitat

We expect that adverse effects to Butte County meadowfoam critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 18.59 acres temporarily and 0.08 acre permanently of critical habitat for the Butte County meadowfoam (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 4.11 percent of 16,644 total acres of the critical habitat for Butte County meadowfoam. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality Butte County meadowfoam critical habitat.

Colusa Grass Critical Habitat

We expect that adverse effects to Colusa grass critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 4.68 acres temporarily and 0.02 acre permanently of critical habitat for the Colusa grass (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 0.08 percent of 152,033 total acres of the critical habitat for Colusa grass. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Colusa grass critical habitat.

Contra Costa Goldfields Critical Habitat

We expect that adverse effects to Contra Costa goldfields critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 14.99 acres temporarily and 0.06 acre permanently of critical habitat for the Contra Costa goldfields (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 3.08 percent of 14,739 total acres of the critical habitat for Contra Costa goldfields. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Contra Costa goldfields critical habitat.

Cushenbury Buckwheat Critical Habitat

We expect that adverse effects to Cushenbury buckwheat critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 4.78 acres temporarily and 0.02 acre permanently of critical habitat for the Cushenbury buckwheat (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 1.32 percent of 6,959 total acres of the critical habitat for Cushenbury buckwheat. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Cushenbury buckwheat critical habitat.

Cushenbury Milk-Vetch Critical Habitat

We expect that adverse effects to Cushenbury milk-vetch critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 4.83 acres temporarily and 0.02 acre permanently of critical habitat for the Cushenbury milk-vetch (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 2.87 percent of 4,370 total acres of the critical habitat for Cushenbury milk-vetch. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Cushenbury milk-vetch critical habitat.

Cushenbury Oxytheca Critical Habitat

We expect that adverse effects to Cushenbury oxytheca critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 32.8 acres temporarily and 0.01 acre permanently of critical habitat for the Cushenbury oxytheca (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 2.29 percent of 3,151 total acres of the critical habitat for Cushenbury oxytheca. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Cushenbury oxytheca critical habitat.

Fleshy Owl's Clover Critical Habitat

We expect that adverse effects to fleshy owl's clover critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 54.32 acres temporarily and 0.22 acre permanently of critical habitat for the fleshy owl's clover (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 1.05 percent of 175,746 total acres of the critical habitat for fleshy owl's clover. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality fleshy owl's clover critical habitat.

Greene's Tuctoria Critical Habitat

We expect that adverse effects to Greene's tuctoria critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 1.67 acres temporarily and 0.01 acre permanently of critical habitat for the Greene's tuctoria (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 0.01 percent of 145,051 total acres of the critical habitat for Greene's tuctoria. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Greene's tuctoria critical habitat.

Hairy Orcutt Grass Critical Habitat

We expect that adverse effects to hairy Orcutt grass critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 28.61 acres temporarily and 0.12 acre permanently of critical habitat for the hairy Orcutt grass (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 1.06 percent of 79,557 total acres of the critical habitat for hairy Orcutt grass. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of hairy Orcutt grass critical habitat.

Hoover's Spurge Critical Habitat

We expect that adverse effects to Hoover's spurge critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 6.27 acres temporarily and 0.03 acre permanently of critical habitat for the Hoover's spurge (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 0.13 percent of 114,867 total acres of the critical habitat for Hoover's spurge. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Hoover's spurge critical habitat.

La Graciosa Thistle Critical Habitat

We expect that adverse effects to La Graciosa thistle critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 31.33 acres temporarily and 0.13 acre permanently of critical habitat for the La Graciosa thistle (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 5.84 percent of 24,094 total acres of the critical habitat for La Graciosa thistle. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of La Graciosa thistle critical habitat.

Monterey Spineflower Critical Habitat

We expect that adverse effects to Monterey spineflower critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 11.83 acres temporarily and 0.05 acre permanently of critical habitat for the Monterey spineflower (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 1.34 percent of 11,057 total acres of the critical habitat for Monterey spineflower. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Monterey spineflower critical habitat.

Parish's Daisy Critical Habitat

We expect that adverse effects to Parish's daisy critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 5.26 acres temporarily and 0.02 acre permanently of critical habitat for the Parish's daisy (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 4.03 percent of 4,424 total acres of the critical habitat for Parish's daisy. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Parish's daisy critical habitat.

Sacramento Orcutt Grass Critical Habitat

We expect that adverse effects to Sacramento Orcutt grass critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 20.23 acres temporarily and 0.08 acre permanently of critical habitat for the Sacramento Orcutt grass (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 2.73 percent of 33,277 total acres of the critical habitat for Sacramento Orcutt grass. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Sacramento Orcutt grass critical habitat.

San Diego Ambrosia Critical Habitat

We expect that adverse effects to San Diego ambrosia critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 3.35 acres temporarily and 0.01 acre permanently of critical habitat for the San Diego ambrosia (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 4.12 percent of 1,113 total acres of the critical habitat for San Diego ambrosia. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of San Diego ambrosia critical habitat.

<u>San Joaquin Orcutt Grass Critical Habitat</u>

We expect that adverse effects to San Joaquin Orcutt grass critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 28.32 acres temporarily and 0.12 acre permanently of critical habitat for the San Joaquin Orcutt grass (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 0.65 percent of 136,189 total acres of the critical habitat for San Joaquin Orcutt grass. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service’s policy of no net loss. This would ultimately maintain or enhance the quantity and quality of San Joaquin Orcutt grass critical habitat.

<u>Slender Orcutt Grass Critical Habitat</u>

We expect that adverse effects to slender Orcutt grass critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 28.34 acres temporarily and 0.12 acre permanently of critical habitat for the slender Orcutt grass (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 1.34 percent of 94,692 total acres of the critical habitat for slender Orcutt grass. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service’s policy of no net loss. This would ultimately maintain or enhance the quantity and quality of slender Orcutt grass critical habitat.

<u>Southern Mountain Wild-Buckwheat Critical Habitat</u>

We expect that adverse effects to Southern Mountain wild-buckwheat critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 2.74 acres temporarily and 0.01 acre permanently of critical habitat for the Southern Mountain wild-buckwheat (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 5.82 percent of 903 total acres of the critical habitat for Southern Mountain wild-buckwheat. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Southern Mountain wild-buckwheat critical habitat.

<u>Spreading Navarretia Critical Habitat</u>

We expect that adverse effects to spreading navarretia critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 3.53 acres temporarily and 0.01 acre permanently of critical habitat for the spreading navarretia (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 1.4 percent of 6,726 total acres of the critical habitat for spreading navarretia. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of spreading navarretia critical habitat.

<u>Vandenberg Monkeyflower Critical Habitat</u>

We expect that adverse effects to Vandenberg monkeyflower critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 5.95 acres temporarily and 0.02 acre permanently of critical habitat for the Vandenberg monkeyflower (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 2.86 percent of 5,727 total acres of the critical habitat for

Vandenberg monkeyflower. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Vandenberg monkeyflower critical habitat.

Ventura Marsh Milk-Vetch

We expect that adverse effects to Ventura Marsh milk-vetch critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 1.74 acres temporarily and 0.01 acre permanently of critical habitat for the Ventura Marsh milk-vetch (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 6.12 percent of 426 total acres of the critical habitat for Ventura Marsh milk-vetch. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Ventura Marsh milk-vetch critical habitat.

Yadon's Piperia Critical Habitat

We expect that adverse effects to Yadon's piperia critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 4.08 acres temporarily and 0.02 acre permanently of critical habitat for the Yadon's piperia (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 3.11 percent of 2,118 total acres of the critical habitat for Yadon's piperia. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain or enhance the quantity and quality of Yadon's piperia critical habitat.

Yellow Larkspur Critical Habitat

We expect that adverse effects to yellow larkspur critical habitat could include: increased erosion and sedimentation; increase in temperature; changes in water quality; changes in air quality; introduction of invasive competitors or disease; and changes in hydrology. The result of these effects on critical habitat are described at the beginning of this section.

Project activities could affect up to 11.08 acres temporarily and 0.05 acre permanently of critical habitat for the yellow larkspur (Caltrans 2023). The condition of critical habitat, if present at a given project location, is likely marginal in most cases because developed areas, such as road shoulders along the SHS where project activities are expected to occur, are unlikely to support PBFs of critical habitat. Additionally, the amount of critical habitat within the study area (which encompasses the area that could be subjected to direct or indirect effects to habitat; see Figure 1) represents less than 18.2 percent of 2,518 total acres of the critical habitat for yellow larkspur. Caltrans will offset temporary and permanent impacts to critical habitat that contain PBFs through compensatory mitigation that meets the Service’s policy of no net loss. This would ultimately maintain or enhance the quantity and quality of yellow larkspur critical habitat.

CUMULATIVE EFFECTS

Cumulative effects “are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation” (50 CFR 402.02). Future Federal actions are not considered cumulative effects because they are subject to consultation, pursuant to section 7(a)(2) of the Act.

The potential exists that future activities could occur within Caltrans’ rights-of-way that do not have a federal nexus. At this time, we are unaware of any such activities.

CONCLUSION

Conclusion for Species

The regulatory definition of “to jeopardize the continued existence of the species” focuses on assessing the effects of the proposed action on the reproduction, numbers, and distribution, and their effect on the survival and recovery of the species being considered in this PBO. For that reason, we have used those aspects of the species’ status as the basis to assess the overall effect of the proposed action on the species.

After reviewing the current status of the 97 covered species in Table 1 (Appendix A), the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological and conference opinion that the proposed action is not likely to jeopardize the continued existence of these species. The basis for this conclusion includes:

1. Caltrans' commitment to implement all general and species-specific conservation measures, as applicable;
2. Caltrans' commitment to limit temporary and permanent impacts to covered species' habitat, as described in Tables 18 and 19;
3. Caltrans' commitment to not exceed self-imposed take limits, as described in Table 6;
4. The proposed action would not appreciably reduce the reproductive capacity, number of individuals, or distribution of covered species; and
5. The proposed action would not cause any effects that would preclude our ability to recover the covered species.

This PBO includes our conference opinion addressing eight proposed species and one candidate species. Regulations allow for an opinion issued at the conclusion of a conference to be adopted as a biological opinion when the species is listed or critical habitat is designated, but only if no significant new information is developed (including that developed during the rulemaking process on the proposed listing or critical habitat designation) and no significant changes to the Federal action are made that would alter the content of the opinion (50 CFR 402.10(d)).

Conclusion for Critical Habitats

"Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species" (50 CFR 402.02). We determine whether a proposed action is likely to result in the destruction or adverse modification of critical habitat through an analysis of how a proposed action affects the physical and biological features of critical habitat within the action area in relation to the entirety of designated critical habitat. For the covered critical habitats in Table 1, this process involves considering the effects at the level of the action area, then at the level of critical habitat unit, and then finally for the entirety of the critical habitat designation.

After reviewing the current status of the 40 critical habitats in Table 1, the environmental baseline of critical habitats in the action area, the effects of the proposed action on critical habitats, and the cumulative effects, it is the Service's biological and conference opinion that the proposed action is not likely to result in the destruction or adverse modification of the covered critical habitats. We have reached this conclusion because the adverse effects to critical habitat would occur on a small portion of the critical habitat designations, and Caltrans will offset impacts to critical habitat through compensatory mitigation that meets the Service's policy of no net loss. This would ultimately maintain the quantity and quality of critical habitat.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened animal species, respectively, without special exemption. Take is defined by the Act as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of an incidental take statement and occurs as a result of the action as proposed. Because section 9 of the Act does not prohibit take of proposed or candidate animal species, an incidental take statement provided with a conference opinion does not become effective unless the Service adopts the opinion once the listing is final (50 CFR 402.10(d)).

This incidental take statement is based upon the proposed action occurring as described in the accompanying PBO. Caltrans must implement the proposed action as described in the PBO. For projects which Caltrans is not undertaking, but Caltrans or FHWA is authorizing or funding, Caltrans or FHWA must ensure that the permittee or applicant implements the proposed action as described in the PBO.

Listed Plants

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species; however, limited protection of listed plants is provided at section 9(a)(2) to the extent that the Act prohibits the removal and reduction to possession of federally listed plants or the malicious damage of such plants on areas under Federal jurisdiction, or the destruction of listed plants on non-Federal areas in violation of State law or regulation or in the course of a violation of a State criminal trespass law. Also, “take” as defined in section 3(19) of the Act does not apply to listed plant species; thus, this Incidental Take Statement does not include discussion of covered plants.

AMOUNT OR EXTENT OF TAKE

We anticipate that some covered animals could be taken as a result of the proposed action. As stated earlier in this PBO, Caltrans proposed self-imposed take limits for each of the covered animal species (see Table 6). As a result of the creation of the self-imposed take limits, and because the Service concluded in this PBO that take up to the self-imposed limits, in combination with Caltrans’ proposed conservation measures, is not likely to jeopardize the continued existence of the covered species, the estimated amount of take that is reasonably certain to occur as a result of the proposed action, as described in the PBO, is identical to the self-imposed take limits established in the project description. We provide these numbers for the purposes of the incidental take statement in Table 20, below. Caltrans or FHWA will not authorize, fund, or carry out any new projects that have the potential to exceed the self-imposed take limits and will meet with the Service to discuss reinitiation, as the exemption provided pursuant to section 7(o)(2) may lapse and any further take could be a violation of section 4(d) or 9. Reinitiation of formal consultation would also require re-evaluation of the effects of the action on the respective species.

Table 20. Caltrans' self-imposed amount and extent of take.

Covered Species Common Name	Self-Imposed Take Limits: Injury, Mortality, Harm	Self-Imposed Take Limits: Capture and Relocation
Mammals		
Buena Vista Lake ornate shrew	Injury or mortality of 5 individuals.	5 Individuals
Giant kangaroo rat	Injury or mortality of 5 individuals.	40 Individuals
Peninsular bighorn sheep	None	None
Point Arena mountain beaver	None	None
Salt marsh harvest mouse	None	None
San Bernardino Merriam's kangaroo rat	Injury or mortality of 5 individuals.	40 Individuals
Stephen's kangaroo rat	Injury or mortality of 5 individuals.	20 Individuals
Tipton kangaroo rat	Injury or mortality of 5 individuals.	20 Individuals
Birds		
California Ridgway's rail	None	None
California spotted owl – Coastal-Southern California DPS	Reduced productivity for 4 nesting pairs due to increased noise, lighting, and construction disturbance for one breeding season.	None
California spotted owl – Sierra Nevada DPS	Reduced productivity for 4 nesting pairs due to increased noise, lighting, and construction disturbance for one breeding season.	None
Coastal California gnatcatcher	Reduced productivity for 5 nesting pairs due to increased noise, lighting, and construction disturbance for one breeding season.	None
Least Bell's vireo	Reduced productivity for 5 nesting pairs due to increased noise, lighting, and construction disturbance for one breeding season.	None
Northern spotted owl	Reduced productivity for 4 nesting pairs due to increased noise, lighting, and construction disturbance for one breeding season.	None
Southwestern willow flycatcher	Reduced productivity for 5 nesting pairs due to increased noise, lighting, and construction disturbance for one breeding season.	None
Yuma Ridgway's rail	None	None

Covered Species Common Name	Self-Imposed Take Limits: Injury, Mortality, Harm	Self-Imposed Take Limits: Capture and Relocation
Reptiles		
Alameda whipsnake	Injury or mortality of 5 individuals.	5 Individuals
Blunt-nosed leopard lizard	None	None
Coachella Valley fringe-toed lizard	Injury or mortality of 5 individuals.	5 Individuals
Giant garter snake	Injury or mortality of 5 individuals.	5 Individuals
Northwestern pond turtle	Injury or mortality of 30 individuals and disturbance of 3 nests.	100 Individuals
San Francisco garter snake	None	None
Southwestern pond turtle	Injury or mortality of 10 individuals and disturbance of 2 nests.	50 Individuals
Amphibians		
Arroyo toad	Injury or mortality of 10 individuals.	50 Individuals
California red-legged frog	Injury or mortality of 15 individuals.	75 Individuals
California tiger salamander–Central Valley DPS	Injury or mortality of 15 individuals. Not to exceed 25 acres of suitable aquatic habitat impacted directly or indirectly by adverse effects within 250 feet of the feature.	75 Individuals
California tiger salamander–Santa Barbara DPS	Injury or mortality of 5 individuals. Not to exceed 1 acre of suitable aquatic habitat impacted directly or indirectly by adverse effects within 250 feet of the feature.	25 Individuals
California tiger salamander–Sonoma DPS	Injury or mortality of 5 individuals. Not to exceed 1 acre of suitable aquatic habitat impacted directly or indirectly by adverse effects within 250 feet of the feature.	25 Individuals
Kern Canyon slender salamander	Injury or mortality of 5 individuals.	10 Individuals
Relictual slender salamander	Injury or mortality of 5 individuals.	10 Individuals
Western spadefoot–northern DPS	Injury or mortality of 30 individuals.	100 Individuals
Western spadefoot–southern DPS	Injury or mortality of 15 individuals.	75 Individuals
Insects		
Bay checkerspot butterfly	Removal of 50 host plants.	None
Behren’s silverspot butterfly	Removal of 75 host plants.	None
Callippe silverspot butterfly	Removal of 50 host plants.	None

Covered Species Common Name	Self-Imposed Take Limits: Injury, Mortality, Harm	Self-Imposed Take Limits: Capture and Relocation
Casey’s June beetle	Injury or mortality of 5 individuals	5 Individuals
Delhi sands flower-loving fly	0.62 acre of impact on suitable habitat.	None
Mission blue butterfly	Removal of 50 host plants.	None
Monarch butterfly	Removal of 100 breeding host plants.	None
Mount Herman June beetle	Injury or mortality of 5 individuals.	5 Individuals
Myrtle’s silverspot butterfly	Removal of 75 host plants.	None
Oregon silverspot butterfly	Removal of 50 host plants.	None
Quino checkerspot butterfly	10.00 acres of temporary impact and 0.02 acre of permanent impact on host plants.	None
San Bruno elfin butterfly	Removal of 20 host plants.	None
Smith’s blue butterfly	Removal of 50 host plants.	None
Valley elderberry longhorn beetle	Removal of 100 host plants.	Transplant of 100 host plants
Crustaceans		
Conservancy fairy shrimp	25 acres of suitable aquatic habitat impacted directly or indirectly through adverse effects within 250 feet of the feature.	None
Longhorn fairy shrimp	1 acre of suitable aquatic habitat impacted directly or indirectly through adverse effects within 250 feet of the feature.	None
Riverside fairy shrimp	1 acre of suitable aquatic habitat impacted directly or indirectly through adverse effects within 250 feet of the feature.	None
San Diego fairy shrimp	1 acre of suitable aquatic habitat impacted directly or indirectly through adverse effects within 250 feet of the feature.	None
Vernal pool fairy shrimp	25 acres of suitable aquatic habitat impacted directly or indirectly through adverse effects within 250 feet of the feature.	None
Vernal pool tadpole shrimp	25 acres of suitable aquatic habitat impacted directly or indirectly through adverse effects within 250 feet of the feature.	None

REASONABLE AND PRUDENT MEASURES

The measures described below are non-discretionary and must be undertaken by Caltrans or made binding conditions of any grant or permit issued by Caltrans or FHWA, as appropriate, for the exemption in section 7(o)(2) to apply. Caltrans and FHWA have a continuing duty to regulate the activity covered by this incidental take statement. If Caltrans or FHWA (1) fails to assume and implement the terms and conditions or (2) fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or funding document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, Caltrans or FHWA must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14(i)(3)].

The Service considers the following reasonable and prudent measures necessary and appropriate to minimize the impacts of the incidental take on covered species:

1. Projects under this PBO must be administered in accordance with the procedures negotiated between the Service and Caltrans.

2. Caltrans must allow Service personnel to access work sites to ensure the impacts of the incidental take are being minimized.

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the Act, Caltrans and FHWA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline reporting and monitoring requirements. These terms and conditions are non-discretionary.

1. The following term and condition implements reasonable and prudent measure 1:

   Caltrans or FHWA must follow the administration, notification, review, monitoring, and reporting processes described in the Administration of the PBO, Conservation Measures, and Compensatory Mitigation Framework sections of this PBO.

2. The following term and condition implements reasonable and prudent measure 2:

   Service personnel must be allowed to access work sites in order to ensure the project, including the conservation measures, are being implemented as described in the PBO.

REPORTING REQUIREMENTS

Pursuant to 50 CFR 402.14(i)(3), Caltrans or FHWA must report the progress of the action and its impact on the species to the Service as specified in this incidental take statement. Caltrans will estimate incidental take and habitat impacts for each project when reviewing projects for consistency with this PBO, and will communicate those estimates to the Service using a PNR (see Administration of PBO section). Caltrans will use an internal tracking mechanism to ensure incidental take and habitats impacts are not exceeded. Caltrans must monitor the progress of the action by submitting an annual report to the Service that contains an updated accounting of the take and habitat impacts that are estimated to occur in upcoming projects, and that have occurred following the completion of projects (post-construction reports).

Caltrans must submit the annual report to the Service's Region 8 Regional Office via electronic mail by March 1 (see Administration of the PBO section). Reports must be sent to the Regional Transportation Coordinator and must describe all activities that were conducted under this PBO, including activities and conservation measures that were described in the proposed action and required under the terms and conditions, and discuss any problems that were encountered in implementing conservation measures or terms and conditions and any other pertinent information. Reports must also include the Service's file number for this PBO (2022-0076259-S7-002-R001).

DISPOSITION OF DEAD OR INJURED SPECIMENS

As part of this incidental take statement and pursuant to 50 CFR 402.14(i)(1)(v), upon locating a dead or injured individual of a covered species, initial notification within 3 working days of its finding must be made by electronic mail to the Service's Regional Transportation Coordinator and local Field Office. The report must include the date, time, location of the carcass, a photograph, cause of death or injury, if known, and any other pertinent information. In the subject of the notification, include the Service's reference number for the consultation (2022-0076259-S7-002-R001) and the county the project is in.

Caltrans must take care in handling injured animals to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible state. Caltrans must transport injured animals to a qualified veterinarian. Should any treated animal(s) survive, Caltrans must contact the Service regarding the final disposition of the animal(s).

Dead specimens must be sent to an appropriate institution depending on the species and location. Caltrans should contact a local Service field office for instructions regarding the final disposition of dead animals.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. The conservation recommendations below are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information and can be used by Caltrans to fulfill their 7(a)(1) obligations.

1. We recommend that Caltrans fill out and submit CNDDB field survey forms for all rare or sensitive species observed during this project. For instructions on how to submit data, refer to https://wildlife.ca.gov/Data/CNDDB/Submitting-Data.

2. We recommend that the approved biologist(s) relocate other native reptiles and amphibians found within work areas to suitable habitat outside of project areas, provided that such relocation is in compliance with State laws.

3. We recommend that Caltrans test covered amphibian species for amphibian disease if individuals are found dead within work areas.

The Service requests notification of the implementation of any conservation recommendations so we may be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats.

REINITIATION NOTICE

This concludes formal consultation on the action(s) outlined in the request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, the exemption issued pursuant to section 7(o)(2) may have lapsed and any further take could be a violation of section 4(d) or 9.

If you have any questions about this biological opinion, please contact David Sherer of my staff by electronic mail at david_sherer@fws.gov.

Sincerely,

Elisha Hull

Digitally signed by ELISHA HULL
Date: 2024.08.01 08:34:53
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Elisha Hull
Deputy Assistant Regional Director

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APPENDIX A

Status of the Species and Critical Habitats

This Appendix describes the rangewide status of the covered species and critical habitats in the PBO (see Table 1). We describe factors, such as life history, distribution, and population size and trends, which help determine the likelihood of both survival and recovery of the species.

The information in this Appendix provides additional information used for the Jeopardy and Adverse Modification analyses in the PBO.

Table 1. Species and critical habitats analyzed in the PBO.

Common Name	Scientific Name	Status	Critical Habitat
Mammals			
Buena Vista Lake ornate shrew	*Sorex ornatus relictus*	E	No
Giant kangaroo rat	*Dipodomys ingens*	E	N/A
Peninsular bighorn sheep	*Ovis canadensis nelsoni*	E	Yes
Point Arena mountain beaver	*Aplodontia rufa nigra*	E	N/A
Salt marsh harvest mouse	*Reithrodontomys raviventris*	E	N/A
San Bernardino Merriam's kangaroo rat	*Dipodomys merriami parvus*	E	Yes
Stephen's kangaroo rat	*Dipodomys stephensi* (incl. *D. cascus*)	T	N/A
Tipton kangaroo rat	*Dipodomys nitratoides nitratoides*	E	N/A
Birds			
California Ridgway's rail	*Rallus obsoletus obsoletus*	E	N/A
California spotted owl – Coastal Southern California DPS	*Strix occidentalis occidentalis*	PE	N/A
California spotted owl – Sierra Nevada DPS	*Strix occidentalis occidentalis*	PT	N/A
Coastal California gnatcatcher	*Polioptila californica californica*	T	Yes
Least Bell's vireo	*Vireo bellii pusillus*	E	Yes
Northern spotted owl	*Strix occidentalis caurina*	T	Yes
Southwestern willow flycatcher	*Empidonax traillii extimus*	E	Yes
Yuma Ridgway's rail	*Rallus obsoletus yumanensis*	E	N/A
Reptiles			
Alameda whipsnake (= striped racer)	*Masticophis lateralis euryxanthus*	T	Yes
Blunt-nosed leopard lizard	*Gambelia silus*	E	N/A
Coachella Valley fringe-toed lizard	*Uma inornata*	T	No
Giant garter snake	*Thamnophis gigas*	T	N/A
Northwestern pond turtle	*Actinemys marmorata*	PT	N/A
San Francisco garter snake	*Thamnophis sirtalis tetrataenia*	E	N/A
Southwestern pond turtle	*Actinemys pallida*	PT	N/A

Common Name	Scientific Name	Status	Critical Habitat
Amphibians			
Arroyo toad	*Anaxyrus californicus*	E	No
California red-legged frog	*Rana draytonii*	T	Yes
California tiger salamander – Central California DPS	*Ambystoma californiense*	T	Yes
California tiger salamander – Santa Barbara County DPS	*Ambystoma californiense*	E	Yes
California tiger salamander – Sonoma DPS	*Ambystoma californiense*	E	Yes
Kern Canyon slender salamander	*Batrachoseps simatus*	PT	No
Relictual slender salamander	*Batrachoseps relictus*	PE	No
Western spadefoot – northern DPS	*Spea hammondii*	PT	N/A
Western spadefoot – southern DPS	*Spea hammondii*	PT	N/A
Insects			
Bay checkerspot butterfly	*Euphydryas editha bayensis*	T	Yes
Behren's silverspot butterfly	*Speyeria zerene behrensii*	E	N/A
Callippe silverspot butterfly	*Speyeria callippe*	E	N/A
Casey's June beetle	*Dinacoma caseyi*	E	No
Delhi sands flower-loving fly	*Rhaphiomidas terminatus abdominalis*	E	N/A
Mission blue butterfly	*Icaricia icarioides missionensis*	E	N/A
Monarch butterfly	*Danaus plexippus*	C	N/A
Mount Hermon June beetle	*Polyphylla barbata*	E	N/A
Myrtle's silverspot butterfly	*Speyeria zerene myrtleae*	E	N/A
Oregon silverspot butterfly	*Speyeria zerene hippolyta*	T	N/A
Quino checkerspot butterfly	*Euphydryas editha quino*	E	Yes
San Bruno elfin butterfly	*Callophrys mossii bayensis*	E	N/A
Smith's blue butterfly	*Euphilotes enoptes smithi*	E	N/A
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	T	N/A
Crustaceans			
Conservancy fairy shrimp	*Branchinecta conservatio*	E	N/A
Longhorn fairy shrimp	*Branchinecta longiantenna*	E	N/A
Riverside fairy shrimp	*Streptocephalus woottoni*	E	No
San Diego fairy shrimp	*Branchinecta sandiegonensis*	E	No
Vernal pool fairy shrimp	*Branchinecta lynchi*	T	Yes
Vernal pool tadpole shrimp	*Lepidurus packardi*	E	Yes
Plants			
Ash-grey paintbrush *Critical Habitat Only*	*Castilleja cinerea*	T	Yes
Baker's larkspur	*Delphinium bakeri*	E	N/A
Beach layia	*Layia carnosa*	T	N/A

Common Name	Scientific Name	Status	Critical Habitat
Bear Valley sandwort *Critical Habitat Only*	*Arenaria ursina*	T	Yes
Ben Lomond (Santa Cruz) wallflower	*Erysimum teretifolium*	E	N/A
Butte County meadowfoam	*Limnanthes floccosa* ssp. *californica*	E	Yes
California orcutt grass	*Orcuttia californica*	E	N/A
Chorro Creek bog thistle	*Cirsium fontinale* var. *obispoense*	E	N/A
Coachella Valley milk-vetch	*Astragalus lentiginosus* var. *coachellae*	E	No
Colusa grass	*Neostapfia colusana*	T	Yes
Contra Costa goldfields	*Lasthenia conjugens*	E	Yes
Cushenbury buckwheat	*Eriogonum ovalifolium* var. *vineum*	E	Yes
Cushenbury milk-vetch *Critical Habitat Only*	*Astragalus albens*	E	Yes
Cushenbury oxytheca *Critical Habitat Only*	*Oxytheca parishii* var. *goodmaniana*	E	Yes
Few-flowered navarretia	*Navarretia leucocephala* ssp. *pauciflora*	E	N/A
Fleshy owl's-clover	*Castilleja campestris* ssp. *succulenta*	T	Yes
Gentner's fritillary	*Fritillaria gentneri*	E	N/A
Greene's tuctoria	*Tuctoria greenei*	E	Yes
Hairy orcutt grass	*Orcuttia pilosa*	E	Yes
Hoover's spurge	*Chamaesyce hooveri*	T	Yes
Howell's spineflower	*Chorizanthe howellii*	E	N/A
Ione (incl. Irish Hill) buckwheat	*Eriogonum apricum* (incl. var. *prostratum)*	E	N/A
Ione manzanita	*Arctostaphylos myrtifolia*	T	N/A
Kern mallow	*Eremalche kernensis*	E	N/A
La Graciosa thistle *Critical Habitat Only*	*Cirsium loncholepis*	E	Yes
Layne's butterweed	*Senecio layneae*	T	N/A
Loch Lomond coyote thistle	*Eryngium constancei*	E	N/A
Many-flowered navarretia	*Navarretia leucocephala* ssp. *plieantha*	E	N/A
Menzie's wallflower	*Erysimum menziesii*	E	N/A
Monterey spineflower	*Chorizanthe pungens* var. *pungens*	T	Yes
Nipomo Mesa lupine	*Lupinus nipomensis*	E	N/A
Palmate-bracted bird's-beak	*Cordylanthus palmatus*	E	N/A
Parish's daisy	*Erigeron parishii*	T	Yes
Pedate checker-mallow	*Sidalcea pedata*	E	N/A
Pine Hill ceanothus	*Ceanothus roderickii*	E	N/A
Pismo clarkia	*Clarkia speciosa* ssp. *immaculata*	E	N/A
Sacramento orcutt grass	*Orcuttia viscida*	E	Yes
San Bernardino bluegrass	*Poa atropurpurea*	E	No
San Diego ambrosia	*Ambrosia pumila*	E	Yes

Common Name	Scientific Name	Status	Critical Habitat
San Diego button-celery	*Eryngium aristulatum* var. *parishii*	E	N/A
San Diego mesa-mint	*Pogogyne abramsii*	E	N/A
San Jacinto Valley crownscale	*Atriplex coronata* var. *notatior*	E	N/A
San Joaquin Valley orcutt grass	*Orcuttia inaequalis*	T	Yes
San Joaquin wooly-threads	*Monolopia* (=*Lembertia*) *congdonii*	E	N/A
Santa Clara Valley dudleya	*Dudleya setchellii*	E	N/A
Santa Monica Mountains dudleya	*Dudleya cymosa* ssp. *ovatifolia*	T	N/A
Slender orcutt grass	*Orcuttia tenuis*	T	Yes
Southern Mountain wild-buckwheat *Critical Habitat Only*	*Eriogonum kennedyi* var. *austromontanum*	T	Yes
Spreading navarretia	*Navarretia fossalis*	T	Yes
Stebbins' morning-glory	*Calystegia stebbinsii*	E	N/A
Thread-leaved brodiaea	*Brodiaea filifolia*	T	No
Vandenberg monkeyflower *Critical Habitat Only*	*Diplacus vandenbergensis*	E	Yes
Ventura Marsh milk-vetch *Critical Habitat Only*	*Astragalus pycnostachyus* var. *lanosissimus*	E	Yes
Yadon's piperia *Critical Habitat Only*	*Piperia yadonii*	E	Yes
Yellow larkspur *Critical Habitat Only*	*Delphinium luteum*	E	Yes

E = Federally Endangered
PE = Proposed Endangered
C = Candidate
T = Federally Threatened
PT = Proposed Threatened
N/A = Critical habitat not designated *or* critical habitat not present in action area

Mammals

Buena Vista Lake Ornate Shrew

Listing Status

The Buena Vista Lake ornate shrew was listed as endangered on March 6, 2002 (Service, 2002). The Service designated critical habitat for this species on July 2, 2013 (Service, 2013).

Life History and Habitat

The Buena Vista Lake ornate shrew is a small mammal found only in the Tulare Basin of the San Joaquin Valley, California. It is one of nine subspecies of ornate shrew and is a member of the "red-toothed" shrew subfamily, which gets its name from the reddish iron-based pigment that is thought to strengthen their tooth enamel and gives their teeth a red color.

The Buena Vista Lake ornate shrew is about the size of a mouse but with smaller eyes, a longer more pointed snout, and five toes on their front feet rather than the four that mice have. Like other shrews, this subspecies does not have the continuously growing front teeth that mice and other rodents use for gnawing. The Buena Vista Lake ornate shrew is grayish-black with a pale underbelly.

The Buena Vista Lake ornate shrew requires dense groundcover to protect it from predators and moist soil that supports diverse prey populations of insects, earthworms, and other small invertebrates. Buena Vista Lake ornate shrews can be found near water sources in protective groundcover like deep leaf litter, cattails and fallen logs. The moist soil and dense cover hide the shrews from predators and attract insects, worms, and other invertebrates that shrews eat. This subspecies can also sometimes be found in drier grassland and desert scrub within a few hundred feet of water sources or where water is close to the surface and their prey can be found.

The Buena Vista Lake ornate shrew must eat every few hours, so it is active during both the day and night. The specific feeding and foraging habits of the Buena Vista Lake ornate shrew are not well known, but closely related species eat insects, sow bugs, centipedes, spiders, earthworms, slugs, springtails, small frogs and salamanders, and some plants and fungi.

Ornate shrews are solitary and typically breed from early spring through May. Females establish territories that they tend to stay in their whole lives while males may travel between territories. Gestation lasts approximately 21 days, and females give birth to four to six young. Females nurse the young for less than a month. After they are weaned, the young leave to find their own territories. Most ornate shrews live 12 to 16 months.

The species continues to be impacted by:

- Habitat loss due to agricultural and urban development
- Insufficient water supply due to drought and climate change
- Selenium and pesticide contamination

Population Status

The shrew's historical range is thought to be within the moist habitats surrounding the wetlands of the Kern, Buena Vista, Goose and Tulare Lakes on the San Joaquin Valley floor below elevations of 350 feet. Much of the shrew's original wetland habitat has been drained and converted to agricultural land or is no longer suitable habitat due to changes in vegetation and the spread of nonnative plant species. The number of locations considered to be currently occupied by the subspecies increased from eight in 2013 to

15 in 2020; all but three of them have some form of habitat protection, though this protection is minimal in some locations (Service, 2020a).

Recovery Plan Information

The recovery strategy for the Buena Vista Lake ornate shrew is described in the Recovery Plan for Upland Species of the San Joaquin Valley, California (Service, 1998). However, there are currently no recovery criteria (e.g., downlisting/delisting) for the species. Recovery criteria for this species were not included in the recovery plan because it was written and finalized when the Buena Vista Lake ornate shrew was a candidate for listing and not yet listed under the Act (Service, 2020a). However, the recovery plan does provide three general criteria for long-term conservation of the Buena Vista Lake ornate shrew. These criteria include: 1) Habitat protection for three or more disjunct occupied sites collectively with at least 4,940 acres (2,000 hectares) of occupied habitat; 2) An approved and implemented management plan for all protected areas that includes survival of the species as an objective; and 3) Population monitoring in specified recovery areas that shows continuing Buena Vista Lake ornate shrew presence at known occupied sites (Service, 1998).

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Giant Kangaroo Rat

Listing Status

The Service listed the giant kangaroo rat as endangered on January 5, 1987 (Service, 1987). The Service has not designated critical habitat for this species.

Life History and Habitat

The giant kangaroo rat is the largest member of the family that includes kangaroo rats, kangaroo mice, and pocket mice. Named for its unique two-footed hopping movements, the giant kangaroo rat lives in grassland areas generally along the western edge of the San Joaquin Valley from Fresno County in the north to Kern County in the south and the Carrizo Plain and Cuyama Valley in San Luis Obispo County.

They have large, flattened heads and short necks. Large, fur-lined cheek pouches extend as deep pockets of skin along the sides of the head, which they fill with seeds as they forage. Their hind limbs are large compared to the size of their forelimbs. These strong rear legs enable the species to hop from place to place and evade predators, such as snakes, quickly. Their tails are longer than their combined head and body length. The tails have a crest of long hairs, terminating in a large tuft.

Giant kangaroo rats are distinguished from the similar San Joaquin kangaroo rats (*Dipodomys nitratoides*) by the number of toes on their hind feet; giant kangaroo rats have five toes while San Joaquin kangaroo rats have four. The giant kangaroo rat can be distinguished from the more common Heermann's kangaroo rat (*Dipodomys heermanni*) based on a greater hind foot length and body size.

The giant kangaroo rat prefers annual grassland on gentle slopes with sandy soils. However, most remaining populations are on poorer, marginal habitats, which include shrub communities on a variety of soil types and steeper slopes.

Giant kangaroo rats develop burrow systems (called precincts) with one to five or more separate openings. There are generally two types of burrows: 1) vertical shaft with a circular opening and no dirt apron 2) larger, more horizontally-opening shaft—usually wider than high—with a well-worn path leading to the burrow.

Giant kangaroo rats are primarily seed eaters; however, they also eat green plants and insects. Giant kangaroo rats forage above ground from sunset to near sunrise, with most activity taking place in the first two hours after dark. Foraging activity is greatest in the spring as seeds of annual plants ripen. Commonly consumed seeds include peppergrass (*Lepidium spp*.), filaree (*Erodium cicutarium*), Arabian grass (*Schismus arabicus*) and brome grasses (*Bromus spp*.).

The giant kangaroo rat is excellent at storing food for the winter months. They forage for seeds and then place the ripening seed heads in small pits or large stacks on the surface over their burrow system. After curing for several weeks, they move the seeds to underground storage areas.

Reproduction is influenced by population density, availability of food, and environmental conditions. During non-drought years, females can have one to three litters a year with one to four young per litter after approximately 30 days of gestation. Breeding generally occurs in the winter but can extend into the spring and summer months. Their average lifespan is not well documented but is likely around two years. Some individuals have been known to live for six years.

The giant kangaroo rat faces several threats that have the potential to reduce populations. These threats include:

- Habitat conversion and fragmentation due to agricultural use, urban and industrial developments, oil and mineral exploration and extraction, solar energy, water conveyance facilities, and construction of communication and transportation infrastructure.
- Rodenticide use associated with agricultural operations, including legal and illegal cannabis cultivation.

Population Status

The historical distribution of giant kangaroo rats encompassed a narrow band of gently sloping ground along the western edge of the San Joaquin Valley, with occasional colonies on steeper slopes and ridge tops, from Merced County in the north to Kern County in the south and in the Carrizo Plain and Cuyama Valley in San Luis Obispo County. Historical habitat was estimated to be over 1.5 million acres.

Today, the species is currently fragmented into six major geographic units: (1) Ciervo-Panoche in western Fresno and eastern San Benito Counties; (2) Kettleman Hills in southwestern Kings County; (3) San Juan Creek Valley, east of San Luis Obispo County; (4) the Lokern area, Elk Hills, Taft, and Maricopa in western Kern County; (5) the Carrizo Plain in eastern San Luis Obispo County; and (6) the Cuyama Valley along the eastern side of the Santa Barbara-San Luis Obispo County line.

Recovery Plan Information

The recovery strategy for the giant kangaroo rat is described in the Recovery Plan for Upland Species of the San Joaquin Valley, California (Service, 1998). According to the recovery plan, giant kangaroo rat populations can be considered recovered when the three largest populations (western Kern County, Carrizo Plain Natural Area, and the Ciervo-Panoche Natural Area) and the populations in the Kettleman Hills, San Juan Creek Valley, and Cuyama Valley are protected and managed appropriately (Service, 1998). The principal factor in recovering the giant kangaroo rat is protecting existing habitat and key populations. The downlisting and delisting criteria for the giant kangaroo rat include the following (Service, 1998):

Downlisting

1. Protection of occupied habitat:
    a. All occupied lands in the Carrizo Plain Natural Area and Ciervo-Panoche Natural Area;
    b. All occupied lands in western Kern County areas, as specified in the recovery strategy.
2. A management plan, which includes the survival of the giant kangaroo rat as an objective, has been approved and implemented for all protected areas identified as important to the continued survival of the species, including the Carrizo Plain Natural Area.
3. Population monitoring in specified recovery areas shows, during a five-year period, no greater than a 20 percent change in population size during years without drought, or when there is greater than 35 percent above average precipitation.

Delisting:

1. Protection of occupied habitat:
    a. 100% of occupied habitat on public lands in the Cuyama Valley, San Juan Creek Valley, and Kettleman Hills.
2. A management plan, which includes the survival of the giant kangaroo rat as an objective, has been approved and implemented for public lands in the Cuyama Valley and Kettleman Hills.
3. Population monitoring in specified recovery areas shows stable or increasing populations for the Carrizo Plain, Ciervo-Panoche, and western Kern County metapopulations through one precipitation cycle.

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Peninsular Bighorn Sheep and its Critical Habitat

Listing Status

Desert bighorn sheep within the Peninsular Mountain Ranges of the United States were federally listed as an endangered Distinct Population Segment (DPS) on March 18, 1998 (63 FR 13134). A recovery plan was approved in October 2000, and 844,897 acres (341, 918 hectares) of critical habitat were designated on February 1, 2001 (66 FR 8649). The decision to list the Peninsular bighorn sheep was made because of declining population numbers and the continuing loss, degradation, and fragmentation of habitat throughout a significant portion of the population's range. Due to human developments, the population segment had become isolated from other populations of desert bighorn sheep. In addition, periods of depressed recruitment, likely associated with disease, and high predation, coincided with low population numbers endangering the continued existence of these animals in southern California.

Life History and Habitat

In general, bighorn sheep are a wide-ranging species that requires large swaths of relatively pristine land. For example, in the San Jacinto Mountains, fixed-kernel home range sizes averaged 9.65 miles^2 (25 kilometers^2) for rams and 7.72 miles^2 (20 kilometers^2) for ewes (DeForge et al. 1997). Large home ranges allow for animals to move in response to variation in predation pressure and changes in resource availability. The size of individual or group home ranges depends on the juxtaposition of required resources (water, forage, escape, or lambing habitat) and, therefore, varies geographically. Home range size also is affected by forage quantity and quality, season, sex, and age of the animal (Leslie 1977, McQuivey 1978). Although most desert bighorn sheep do not seasonally migrate along elevational gradients like many populations in higher latitude mountain ranges, they do exhibit seasonal differences in habitat use patterns. In many populations, animals will have a smaller home range in summer (McQuivey 1978, Leslie and Douglas 1979, Elenowitz 1983), presumably due to their limited movement away from permanent water sources. During the cooler or wetter months of the year, bighorn sheep often exhibit an expanded range as animals move farther from water sources (Simmons 1980). Ewes generally display a higher degree of philopatry to their seasonal home ranges than do rams.

Rams tend to range more widely, often moving among ewe groups (Boyce et al. 1997, DeForge et al. 1997, Rubin et al. 1998). In most populations of desert bighorn sheep, ram home ranges have been found to be larger than those of ewes (Simmons 1980, DeForge et al. 1997).

Population Status

At the time of listing, the metapopulation of Peninsular bighorn sheep was known to be distributed among at least eight subpopulations in Riverside, Imperial, and San Diego Counties from the San Jacinto Mountains south to the border of Mexico (Rubin et al. 1998, Service 1998). The Santa Rosa Mountains were thought to have two subpopulations at listing. Since listing, an additional subpopulation was identified in the Santa Rosa Mountains. This was reflected in the Recovery Plan (Service 2000), which identified Recovery Regions (required for the recovery of subpopulations) as the nine following areas from north to south: 1) San Jacinto Mountains; 2) Santa Rosa Mountains—north of Hwy 74 (North Santa Rosa Mountains); 3) Santa Rosa Mountains—south of Hwy 74 through Martinez Canyon (Central Santa Rosa Mountains); 4) Santa Rosa Mountains—south of Martinez Canyon (South Santa Rosa Mountains); 5) Coyote Canyon; 6) North San Ysidro Mountains—Henderson Canyon to County Road S-22; 7) South San Ysidro Mountains—County Road S-22 to State Hwy 78; 8) Vallecito Mountains; and 9) Carrizo Canyon/Tierra Blanca Mountains/Coyote Mountains Area. More detailed information on the Recovery Regions for the species can be found in the 5-year review (Service 2011).

Critical Habitat

The final revised critical habitat was designated on April 14, 2009 (Service 2009). Approximately 376,938 acres (152,542 hectares) fall within the boundaries of the critical habitat designation. The Service designates critical habitat to identify the key biological and physical needs of the species and key areas for recovery and to focus conservation actions on those areas. Critical habitat is composed of specific geographic areas that contain the biological and physical features essential to the species' conservation and that may require special management considerations or protection. These features, which include space, food, water, nutrition, cover, shelter, reproductive sites, and special habitats, are called the Primary Constituent Elements (PCEs) of critical habitat.

Pursuant to section 3(5)(A)(i) of the Endangered Species Act and the published rule designating Critical Habitat for the species (74 FR 17288), the following PCEs within the boundaries of Peninsular bighorn sheep Critical Habitat are considered essential to the conservation of the species and may require special management considerations or protection:

1. Moderate to steep, open slopes (20 to 60 percent) and canyons, with canopy cover of 30 percent or less (below 4,600 feet [1,402 meters] elevation in the Peninsular Ranges) that provide space for sheltering, predator detection, rearing of young, foraging and watering, mating, and movement within and between ewe groups;
2. Presence of a variety of forage plants, indicated by the presence of shrubs (e.g., *Ambrosia* spp., *Caesalpinia* spp., *Hyptis* spp., *Sphaeralcea* spp., *Simmondsia* spp.), that provide a primary food source year round, grasses (e.g., *Aristida* spp., *Bromus* spp.) and cacti (e.g., *Opuntia* spp.) that provide a source of forage in the fall, and forbs (e.g. *Plantago* spp., *Ditaxis* spp.) that provide a source of forage in the spring;
3. Steep, rugged slopes (60 percent slope or greater) (below 4,600 feet [1,402 meters] elevation in the Peninsular Ranges) that provide secluded space for lambing as well as terrain for predator evasion;
4. Alluvial fans, washes, and valley bottoms that provide important foraging areas where nutritious and digestible plants can be more readily found during times of drought and lactation and that provide and maintain habitat connectivity by serving as travel routes between and within ewe groups, adjacent mountain ranges, and important resource areas, such as foraging areas and escape terrain; and
5. Intermittent and permanent water sources that are available during extended dry periods and that provide relatively nutritious plants and drinking water.

Recovery Plan Information

Per the Recovery Plan developed by the Service (2000) the following thresholds must be met in order for the species to be delisted:

1. As determined by a scientifically credible monitoring plan, at least 25 ewes must be present in each of the 9 regions of the Peninsular Ranges listed under Downlisting Criterion #1, during each of 12 consecutive years (approximately 2 bighorn sheep generations) including the 6 years under Downlisting Criterion #1, without continued population augmentation.

2. The range-wide population must average 750 individuals (adults and yearlings) with an overall stable or increasing population trend over the same period of 12 consecutive years (approximately 2 generations) as in delisting criterion 1.

Regulatory mechanisms and land management commitments have been established that provide for long-term protection of Peninsular bighorn sheep and all essential habitat as described in section II.D.1 of the recovery plan. Furthermore, connectivity among all portions of habitat must be established, and assured through land management commitments, such that bighorn sheep are able to move freely throughout the Peninsular Ranges.

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Point Arena Mountain Beaver

Listing Status

The Point Arena mountain beaver was federally listed as endangered on December 12, 1991 (56 FR 64716). A final recovery plan was issued June 2, 1998 (Service 1998). Critical habitat has not been proposed or designated. This subspecies is on the State of California's list of mammal species of special concern (CDFW 2019).

Life History and Habitat

Aplodontia appears to be the most primitive of all living rodents, and *Aplodontia rufa* is the only living species in the genus *Aplodontia* and family Aplodontidae (Nowak and Paradiso 1983). The Point Arena mountain beaver (*A. r. nigra*) is one of seven subspecies of mountain beaver, which are found from southern British Columbia to Point Reyes, California, and east to the Cascade and Sierra Nevada ranges (Feldhamer et al. 2003). The Point Arena mountain beaver is geographically isolated from other subspecies by considerable distances; about 130 kilometers (80 miles) south of the Humboldt mountain beaver (*A. r. humboldtiana*) and about 100 kilometers (60 miles) north of the Point Reyes mountain beaver (*A. r. phaea*) (Steele 1986). The Point Arena subspecies differs from the other six subspecies by its unique black coloration, distinctive nasal outline, and several cranial measurements (Taylor 1914). The Point Arena subspecies is the smallest of the six *A. rufa* subspecies found in California (Service 1998).

Mountain beavers are stout, compact and cylindrical rodents having somewhat the form of a muskrat (*Ondatra zibethicus*). Limbs are short, the tail is short and cylindrical, and all digits (5 on all limbs) have long, curved claws. The eyes and ears are small and the fur is dense and short. The pelage above is uniformly grayish or reddish brown for all subspecies, except the Point Arena mountain beaver, which is black. Adults are about 30 centimeters (12 inches) in length and weigh 0.45 to 1.8 kilograms (1–4 pounds). Mountain beavers have a very simple kidney structure that lacks the anatomical features necessary to concentrate urine effectively (Schmidt-Nielsen and Pfeiffer 1970). The inability to concentrate urine and the necessity of a large daily water intake may limit their distribution to areas with rainfall and soil characteristics that promote lush vegetation and nearly 100 percent humidity within burrows (Crocker et al. 2007, Nungesser and Pfeiffer 1965). However, free water may not be an essential habitat component, as captive mountain beavers have been maintained on a diet of succulent vegetation and no water (Fisler 1965). Mountain beavers have a unique auditory system that is specialized for the detection of slow changes in air pressure (Merzenich et al. 1973).

Mountain beavers live in underground burrow systems with numerous openings under moderately tall, lush, perennial vegetation (Service 1998), but are active above ground for extended periods. Burrow openings are approximately 10–28 centimeters (4–11 inches) in diameter and occur every few feet. Tunnels generally run 0.3 meter (1 foot) below the ground's surface (Racey 1922) and are seldom deeper than 1.2 meters (4 feet) below the surface (Feldhamer et al. 2003). Tunnels can extend for more than 100 meters (330 feet) in one direction, but most probably do not exceed 24 meters (80 feet) in length (Camp 1918; Voth 1968). Tunnels may contain five types of underground chambers (Voth 1968): den; food; refuge; fecal pellet; and earth ball storage. Mountain beavers spend about 75 percent of their time in the den chamber (Ingles 1959, Kinney 1971), which are lined with vegetation such as Douglas iris (*Iris douglasiana*; Zielinski et al. 2010). While tunnels of several animals are often connected, they are highly territorial, not colonial, and exhibit little social interaction outside of breeding (Camp 1918; Scheffer 1929). Burrow systems typically occur in cool, moist areas located on north-facing slopes or in gullies, probably due to the mountain beaver's limited ability to thermoregulate (Johnson 1971, Kinney 1971). Soils in occupied habitat are typically friable (i.e., easily crumbled) and well-drained, although the presence of water in tunnels is not uncommon.

Mountain beavers are strictly herbivorous and are known to eat many plants toxic to other vertebrate herbivores including bracken fern (*Pteridium aquilinum*), sword fern (*Polystichum munitum*), stinging nettle (*Urtica* sp.), thistle (*Cirsium* sp.), and larkspur (*Delphinium* sp.) (Voth 1968, Lacy 1991). Based primarily on plants clipped and/or "haystacked" near burrow openings, presumed food plants of the Point Arena mountain beaver include ice plant (*Carpobrotus edulis*), sword fern, cow parsnip (*Heracleum lanatum*), wild radish (*Raphanus sativus*), angelica (*Angelica hendersonii*), Douglas iris, hedge nettle (*Stachys ajugoides*), bush lupine (*Lupinus arboreus*), seaside woolly sunflower (*Eriophyllum staechadifolium*), miner's lettuce (*Claytonia perfoliata*), seaside daisy (*Erigeron glaucus*), and many others (Camp 1918; Fitts 1996; Fitts et al. 2002b; Service 1998; Zielinski et al. 2010). However, some of the species mentioned above may only be used as nesting material. The low nutritional content of many mountain beaver food plants may explain why at least 75 percent of their active time is spent gathering and consuming food (Ingles 1959).

Mountain beavers exhibit a low reproductive potential for a rodent. Females typically do not breed until their second year and are monestrous (i.e., having only a single litter per year) with litters of 2–5 young (Herlocker 1950; Maser et al. 1981; Scheffer 1929). The single breeding season is assumed to occur from December 15 through June 30, based on the period when testes begin to increase in size and the end of lactation (Hubbard 1922; Lovejoy and Black 1979; Pfeiffer 1958; Scheffer 1929). Zielinski and Mazurek (2016) reported that the breeding season for the Point Arena subspecies starts in late November or early December and estimated birthing dates from early- to mid-April, which is later than the mid-February estimate for *A. r. phaea* in Marin County, California (Pfeiffer 1958). Juvenile Point Arena mountain beaver may not be independent until at least mid-July (Zielinski and Mazurek 2016).

Zielinski and Mazurek (2016) captured 38 Point Arena mountain beaver and reported a 1.5 male (M):1 female (F) adult sex ratio and a 1.19M:1F sex ratio for adults and sub-adults combined. Only 3 juveniles (1M:2F) were captured. The sex ratio of juvenile mountain beavers in western Oregon (*A. r. pacifica*) was 1:1 and adults 1.62M:1F (Lovejoy and Black 1979) and Voth (1968) reported a 1.64M:1F adult sex ratio for captured *A. r. pacifica* in the Oregon Coast Range. Hubbard (1922) reported a 3M:1F sex ratio for trapped *A. r. rufa* in Washington State but did not note whether all trapped mountain beaver were adults. It is unknown whether an adult sex ratio skewed toward males is natural or if males are more susceptible to live capture.

The survival rate of marked *A. r. pacifica* in western Oregon was 64 percent after 1 year, with 24 percent still alive after 2 years (Lovejoy and Black 1979). Zielinski et al. (2013a) found that five Point Arena mountain beaver identified by genetic means had also been captured during a previous study (Zielinski et al. 2010), suggesting a naïve estimate of 19 percent (5 of 26) of the population surviving to greater than 2 years of age. Zielinski et al. (2013a) found annual survival rates were higher at their Alder Creek study area (average = 75.6 percent) than at their Kinney Beach study area (average = 60.8 percent). Mountain beavers live an estimated 5–6 years in the wild (Lovejoy and Black 1979).

Limited information exists regarding Point Arena mountain beaver juvenile dispersal. Other subspecies of mountain beaver will disperse up to, and possibly greater than 449 meters (1,474 feet; Hacker and Coblentz 1993); one subadult female dispersed 564 meters (1,850 feet) from her capture site and started to construct a nest (Martin 1971). Dispersal presumably occurs from April 15 through September 30 (Martin 1971; Pfeiffer 1958). Dispersal occurs primarily through excavation from within the natal burrow system, although some animals move overland (Martin 1971). Dispersing animals may make several attempts to establish a den before finding a suitable site. Unoccupied dens and burrow systems may be quickly reoccupied (Hacker and Coblentz 1993). Mountain beavers exhibit site tenacity: Once established, a burrow system is used over the long-term by the same or successive animals. One Point

Arena mountain beaver location at Alder Creek, Manchester, California, appears to have been continuously occupied since it was discovered in 1913 (Service 2009).

The Point Arena mountain beaver is found in a variety of habitat types, including coastal scrub, riparian scrub, northern dune scrub, coastal prairie, freshwater seep, and edges of coniferous forest (Service 1998; Fitts et al. 2002a), provided the habitat has a cool, moist microclimate (e.g., Scherbinski 2018). Billig and Douglas (2007) examined 22 habitat characteristics within 7 known burrow systems on forested Mendocino Redwood Company lands in coastal Mendocino County. Their results suggest that specific herbaceous species such as sword fern and stinging nettle are associated with Point Arena mountain beaver burrow systems, at least within forested habitat. In a more recent study of habitat characteristics directly above den sites, Zielinski et al. (2010) found that Point Arena mountain beaver dens in coastal shrub communities were most likely to occur where vegetation was thick, and on western and northern aspects with moderate slope, and that these factors were stronger predictors of den site location than proximity to cover of important food plant species. While there is at least one observation of burrow openings in a coast redwood (*Sequoia sempervirens*) stand (Service 1998), large trees with extensive root systems apparently impede burrow excavation and produce a mat of duff and exclude sunlight that precludes growth of vegetation used for cover, forage, and nesting material. Some of the other subspecies of mountain beaver are known to rapidly colonize areas where conifers have been removed (Hooven 1973; Neal and Borrecco 1981; Scheffer 1929), and to select areas where coarse woody debris remain following logging (Hacker and Coblentz 1993).

Common plant species found within Point Arena mountain beaver-occupied coastal scrub habitat include coyote brush (*Baccharis pilularis*), cow parsnip, wax myrtle (*Myrica californica*) and other brush species, as well as various *Rubus* spp. Common plant species found within Point Arena mountain beaver-occupied riparian habitat include skunk cabbage (*Lysichitum americanum*), horsetail (*Equisetum telmateia*), willows (*Salix* spp.), red alder (*Alnus rubra*), wood rose (*Rosa gymnocarpa*), and California blackberry (*Rubus ursinus*). At one site with sandy soils, non-native ice plant and non-native European beach grass (*Ammophila arenaria*) were thought to improve habitat suitability by stabilizing soil, which facilitates burrowing, and the former species is also eaten (Fitts 1996). In riparian areas in the forested eastern portion of the Point Arena mountain beaver range, suitable habitat is dominated by red alder and sword fern. Point Arena mountain beavers are occasionally found in willow-dominated riparian areas, but generally on the edge of willow thickets where herbaceous plant species are dominant.

Zielinski and Mazurek (2006) used telemetry and capture locations to estimate Point Arena mountain beaver "use areas" and found that the average area used by an individual was 311.7 square meters (0.031 hectare, 0.077 acre: SD = 394.8 square meters; 0.039 hectare, 0.098 acre). They found no statistical difference between use area size by sex or between adults and subadults, although sample sizes were relatively small. Home ranges of individual mountain beavers are known to overlap Cafferata (1992); however, Zielinski and Mazurek (2006) found that the areas used by individual Point Arena mountain beaver did not appear to overlap much, although different animals were occasionally captured at the exact same location.

Population Status

The Point Arena mountain beaver occurs only in southern coastal Mendocino County, California (Service 1998). The Service considers the subspecies geographic range as the area from 3.2 kilometers (2 miles) north of Bridgeport Landing, south to 4.8 kilometers (3 miles) south of Point Arena, California (for a total distance of about 24.6 kilometers (15.3 miles)) and inland from the coast approximately 8 kilometers (5 miles). The Service further defined the "potential range" of the Point Arena mountain beaver as all known detection location records buffered by 3.2 kilometers (2 miles). As of August 2023, the Service has compiled 633 Point Arena mountain beaver detection location records with an estimated "potential range" area of 186 square kilometers (18,600 hectares; 45,962 acres) (Service unpublished data). However, much of this "potential range" is considered unsuitable for Point Arena mountain beaver. Zielinski et al. (2015) estimated that only about 40 percent (70 square kilometers; 7,000 hectares; 17,297 acres) of the geographic range–similar in size and extent (174 square kilometers; 17,400 hectares; 42,996 acres) to the Service's aforementioned "potential range" of 186 square kilometers (18,600 hectares; 45,962 acres)–contained suitable habitat for Point Arena mountain beaver, and that only about 26 percent of suitable Point Arena mountain beaver habitat (18 square kilometers; 1,800 hectares; 4,448 acres) was occupied by Point Arena mountain beaver.

When the subspecies was listed as endangered in 1991, the Service estimated the total range-wide population size at 100 individuals occurring within 10 "known sites" or "populations" (56 FR 64716). In the 1998 recovery plan, at least 26 separate "populations" were identified, and the total population size was revised and estimated at 200 to 500 individuals (Service 1998). In 2009, the Service (Service 2009) reported 14 "geographic groupings" of Point Arena mountain beaver within the 26 "populations" identified by the 1998 recovery plan but did not estimate population size. The Service added 5 new "geographic groupings" based on Point Arena mountain beaver occurrence records obtained since 2009 (Service unpublished data). In addition, since 2016, the Service has confirmed Point Arena mountain beaver occupancy within 10 of the 14 "geographic groupings" reported in the 2009 status review (Service unpublished data). No range-wide population size estimate has been made since the 1998 recovery plan. However, using hair samples and genotyping, Zielinski et al. (2013a) estimated abundance of Point Arena mountain beavers at two locations, Kinney Beach and Alder Creek, within Manchester State Park. Population estimates ranged from 8–18 individuals at Kinney Beach and 15–17 individuals at Alder Creek with neither population demonstrating a trend in abundance over the 4-year sample period. Zielinski et al. (2013a) did not extrapolate the Kinney Beach and/or the Alder Creek population estimates to the entire range of the subspecies to estimate population size for the entire subspecies.

Point Arena mountain beaver population estimates are crude and have been based on observations and conservative counts of approximately 5 to 10 burrow openings per animal (Service 1998), however, little empirical justification exists for this ratio, and no distinction is made between active and inactive burrow openings. Although a honeycomb of burrow openings in an area may suggest many individuals, the number of individuals may not be related to the number of burrow openings since several animals may share the same contiguous burrow system, and each individual's portion of the burrow system may exhibit many openings (Service 1998). For some subspecies, site-specific estimates are available on the relationship between the number of burrow openings and number of animals. For example, a total of 11 *A. r. phaea* were found in a burrow system with over 100 openings, providing a ratio of 9 burrow openings per animal (Camp 1918); *A. r. phaea* occupies similar habitat as the Point Arena mountain beaver and is the closest subspecies geographically, suggesting the 9:1 burrow opening to individual ratio may apply to the Point Arena mountain beaver.

There have been no population trend analyses for the Point Arena mountain beaver due to difficulties in accurately estimating Point Arena mountain beaver density and the limited access to Point Arena mountain beaver-occupied private lands that make up a significant portion of the subspecies range. Zielinski et al. (2013a) estimated Point Arena mountain beaver density at 14.18 animals per hectare (5.74 per acre) and 5.90 animals per hectare (2.39 per acre) for the Alder Creek and Kinney Beach study sites, respectively, within Manchester State Park. For other mountain beaver subspecies, density estimates range from 0.49 animals per hectare (0.2 per acre; Arjo et al. 2007) to 14.0 animals per hectare (5.7 per acre; Morris et al. 1995), which are lower than Zielinski et al.’s (2013a) density estimate for the Alder Creek population.

Zielinski et al.’s (2013a) two study areas represent a small fraction of occupied habitat, and the density estimates were made within coastal scrub habitat and may not apply to other habitat types (e.g., coniferous forest, riparian scrub, freshwater seep) used by Point Arena mountain beaver. Therefore, extrapolating their density estimates range-wide to estimate Point Arena mountain beaver population size would not be appropriate. Further, much suitable coastal scrub habitat adjacent to Zielinski et al.’s (2013a) Alder Creek and Kinney Beach study areas and elsewhere within the range of the subspecies was not occupied by Point Arena mountain beaver when surveyed by the Service between 2016 and 2023 (Service unpublished data).

Zielinski et al. (2015) represents the first effort to estimate Point Arena mountain beaver occupancy range-wide, but they did not estimate Point Arena mountain beaver population size range-wide. Zielinski et al. (2015) recommended repeating their range-wide occupancy surveys every five years to monitor trends in Point Arena mountain beaver distribution, but future surveys using their methods will not result in range-wide population estimates or an estimate of population trend.

Recovery Plan Information

The primary threat to the Point Arena mountain beaver is habitat loss and fragmentation from agricultural conversion and residential development, and to a lesser extent, from recreational development (e.g., trails, campgrounds) and road and utilities construction (Service 1998). Historical conversion of suitable Point Arena mountain beaver habitat for agricultural use (mainly for livestock grazing) was extensive and may have substantially reduced the amount of suitable coastal scrub habitat within the range of the subspecies. This large-scale loss and fragmentation of suitable coastal scrub habitat may have substantially reduced Point Arena mountain beaver population size and distribution and isolated many Point Arena mountain beaver-occupied areas by distances greater than the maximum dispersal capabilities of the subspecies, increasing the probability of localized extirpations and subspecies extinction. This is supported by Zielinski et al. (2013b) who suggested that Point Arena mountain beaver gene flow was the lowest in agricultural areas [converted from coastal scrub] and that the negative effects of genetic drift were likely without additional gene flow. Agricultural conversion of suitable Point Arena mountain beaver habitat still occurs, but at a much smaller scale than the historical large-scale conversion prior to federal listing in 1991. Much of the remaining suitable coastal scrub habitat within the subspecies range occurs on protected public lands or on private lands that are largely inaccessible (e.g., in protected riparian corridors) or unbuildable (e.g., steep coastal bluffs). In contrast to future agricultural conversion, residential development is expected to increase with human population growth, especially if climate change causes more humans to migrate to the relatively cool coastal areas. Currently, regulatory constraints on residential development in coastal areas avoid or minimize habitat loss and fragmentation, but regulations may be relaxed in the future under political pressure to accommodate climate change refugees.

Potential threats that may result in direct injury or mortality of Point Arena mountain beaver include collapse of occupied burrow systems by grazing livestock or humans, predation by feral and non-feral domestic pets, vehicle strikes, exposure to rodenticides used on residential, municipal, and agricultural lands, wildfires, flooding, drought, and increased ambient temperatures and reduced rainfall due to climate change. Timber harvest operations may disturb, or even directly kill or injure individual mountain beavers during felling or yarding. Transportation and utility infrastructure construction may result in direct injury or mortality to Point Arena mountain beaver. For example, horizontal directional drilling associated with installation of fiber optic cable conduits and other underground utilities likely caused

Point Arena mountain beaver mortalities in the early 1990s when inert drilling fluids inadvertently "fracked out" and flooded occupied burrow systems near the Garcia River (Service unpublished data). The fracking was likely caused by severe ground vibration during drilling. However, recent advances in horizontal directional drilling methods and equipment result in minimal ground vibration, deeper drilling depths (i.e., well below mountain beaver burrow systems), and a lower probability of fracking and thus is less likely to directly impact Point Arena mountain beaver and Point Arena mountain beaver burrow systems. Over the long-term, fire may play an important role by reducing forested cover resulting in an increase of herbaceous vegetation suitable for mountain beaver. However, after a large fire near Point Reyes, Marin County, California in 1995, only 0.4–1.7 percent of the *A. r. phaea* were thought to have survived the fire and immediate post-fire period (Fellers et al. 2004). Motobu (1978) also found fewer mountain beaver after controlled slash burning in Washington State.

Known or suspected mountain beaver predators such as coyote (*Canis latrans*), bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), long-tailed weasel (*Mustela frenata*), western spotted skunk (*Spilogale gracilis*), great-horned owl (*Bubo virginianus*), and others are relatively common within the range of the Point Arena mountain beaver. Although no data are available on rates of predation on Point Arena mountain beaver, it may be high because the mosaic of habitats within its range would be expected to host a diverse and abundant predator community.

Human-caused disturbance may represent a direct or indirect threat to Point Arena mountain beaver through a disruption of essential behaviors, such as breeding, feeding, or dispersal. As is true of many fossorial animals, mountain beavers have highly developed tactile senses and will respond quickly to the slightest disturbance of their guard hairs or whiskers (Service 1998). As mentioned above, mountain beavers have a unique auditory system that is specialized for the detection of slow changes in air pressure (Merzenich et al. 1973). Thus, while little is known about their actual hearing sensitivity, their fossorial habits and anatomy suggest high sensitivity to ground vibration and noise. Potential sources of disturbance to mountain beavers include, but are not limited to, noise and visual disturbance associated with human presence and activity, mechanically induced noise or ground vibration, and nighttime lighting. Examples of specific activities that may disturb mountain beavers include recreational activities, construction of buildings and roads, and mineral and gravel extraction. However, an active Point Arena mountain beaver burrow system was recently found within a few feet of California State Highway 1 (CA-1), suggesting that some individuals have become habituated to auditory, visual, and vibratory disturbances from vehicular traffic (G. Schmidt, Service, personal observation): Despite heavy daily traffic, the burrow system adjacent to CA-1 has been continuously active since first detected in April 2018. While *Aplodontia* are generally more active at night (Ingles 1959), they can be active at any time of day (Ingles 1959), making it difficult to schedule disturbance-causing human activities in order to minimize negative impacts. Implementation of potentially disturbing activities outside of the breeding season may minimize disruption of breeding and rearing activity.

Since listing, information on the potential threat of climate change has become available. The Intergovernmental Panel on Climate Change (IPCC) concluded that climate warming is unequivocal and continued greenhouse gas emissions at, or above current rates would cause further warming (IPCC 2014). The IPCC also projected a likely increase in the frequency of hot extremes, heat waves, and heavy precipitation (IPCC 2014). A report from the California Climate Change Research Center (Cayan et al. 2006a) made the following findings: (1) All climate models show temperature increases from 2000 to 2100, with projections ranging from about +2 °C to about +6 °C (+3.6 °F to +10.8 °F), and (2) Some of the most dramatic climate change impacts will be experienced as increased frequency and severity of extreme events, such as heat waves, wildfires, and flooding.

A possible explanation for the restricted distribution of mountain beavers is their limited ability to thermoregulate at high ambient temperatures (Johnson 1971; Kinney 1971). In addition, mountain beavers may be confined to moist environments due to their inability to concentrate urine (Nungesser and Pfeiffer 1965). The maritime climate of the subspecies' range provides a significant amount of moisture from fog and a relatively mild climate with low daily and annual fluctuations in temperature. Thus, the mountain beaver's unique physiology may make them especially vulnerable to increased drought conditions and rising temperatures. The current distribution of mountain beaver subspecies is thought to reflect range contractions associated with drier regional climates and reduction of forested habitat since the end of the Eocene epoch 33.9 million years ago (Shotwell 1958). Accordingly, a warmer or drier climate regime may result in future contractions in the occupied distribution of the Point Arena mountain beaver and other mountain beaver subspecies.

Model predictions indicate that California's coast will experience increasing sea levels over the next century, with estimated sea level rise ranging from 13 to 62 centimeters (5.1 to 24.4 inches) to 21.6 to 89.4 centimeters (8.5 to 35.2 inches) depending on the scenario used (Cayan et al. 2006b). When storm effects, such as heavy surf and wind-driven waves, coincide with high tides, the chances of coastal damage are greatly increased (Cayan et al. 2006b). Increases in sea level due to climate change makes this problem more severe (Cayan et al. 2006b) potentially resulting in increased coastal erosion and retreat of coastal bluffs. About 5 percent of known Point Arena mountain beaver sites are located on coastal bluff edges and therefore may be susceptible to cliff erosion. Occupied coastal bluff areas may provide for connectivity between adjacent drainages, thus, the loss of coastal bluff populations may have a disproportionate effect on the overall mountain beaver population than suggested by the 5 percent figure. Also, about 10 percent of known Point Arena mountain beaver sites occur at elevations of 12.2 meters (40 feet) or less and may be more susceptible to flooding due to extreme storm events coupled with sea level rise.

Heavy spring rainfall in 2019 led to flooding of the Garcia River and other smaller creeks and tributaries within the range of the Point Arena mountain beaver. Flood waters covered areas near these water courses known to be occupied by Point Arena mountain beaver. It is unknown whether the flooding killed Point Arena mountain beaver, but it is likely. Although spring flooding is a natural phenomenon, the small and fragmented Point Arena mountain beaver populations are susceptible to extirpation from localized flooding events since much of the remaining occupied Point Arena mountain beaver habitat occurs within riparian areas. An increase in the frequency and intensity of flooding due to climate change may increase the probability of extirpation of Point Arena mountain beaver populations occurring within riparian habitat.

Conservation needs of the Point Arena mountain beaver are summarized by the following recovery objectives identified in the recovery plan (Service 1998): (1) Protect 30 populations in perpetuity from disturbance, (2) Maintain a mean density of at least 1.6 Point Arena mountain beaver per acre of occupied habitat in the 30 populations, (3) Maintain stable or increasing populations in all 30 populations for a period of at least 15 years, (4) Protect and appropriately manage additional habitat needed for population interconnectivity, travel, and dispersal, and (4) Determine and implement adaptive management prescriptions for all populations, including repatriated populations, if deemed necessary.

In their recent 5-year status review (Service 2019), the Service recommended that the subspecies retain its endangered status and recommended future actions to address recovery goals including: (1) Estimating range-wide Point Arena mountain beaver occupancy using methods described in Zielinski et al. (2015) on all public lands and accessible private lands. Repeat occupancy surveys every five years to monitor trends in Point Arena mountain beaver distribution, (2) Identify unprotected suitable habitat on private lands that appear to connect suitable habitat patches on adjacent protected public lands, (3) Delineate suitable habitat patches on public lands and monitor patch size and composition for changes over time, (4) Delineate appropriate conservation units for management based on data on gene flow, dispersal barriers, and potential dispersal distances, and (5) Once sufficient information is gathered revise the current recovery plan to include updated recovery criteria and tasks.

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Salt Marsh Harvest Mouse

Listing Status

The salt marsh harvest mouse was federally listed as endangered in 1970 (35 FR 16047, USFWS 1970). Critical habitat has not been proposed or designated.

There are two subspecies: the northern salt marsh harvest mouse (*Reithrodontomys raviventris halicoetes*) lives in the marshes of the San Pablo and Suisun bays, and the southern salt marsh harvest mouse (*Reithrodontomys raviventris raviventris*) is found in the marshes of Corte Madera, Richmond, and South San Francisco Bay (USFWS 2013).

As described in the Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California (USFWS 2013), the divide between the northern and southern subspecies occurs in San Pablo Bay near China Camp State Park. The southern subspecies, *Reithrodontomys raviventris*, occurs south of the break in habitat near San Pedro Point and the northern subspecies, *Reithrodontomys raviventris halicoetes* occurs to the north. The *raviventris* subspecies has a disjunct distribution. It is found from south of Point Pinole at the southeastern edge of San Pablo Bay, south around the eastern side of Central and South San Francisco Bay and the western side of the San Francisco Peninsula north to about San Mateo. It is also found in the Larkspur-Corte Madera area on the Marin Peninsula. The *halicoetes* subspecies form is found on the east side of the Bay northward essentially from San Pedro Point, around San Pablo Bay and throughout the Suisun Bay. It too, has a disjunct distribution, in that it is also found on the Contra Costa County coast from the Pittsburg area to the Carquinez Straits.

Life History and Habitat

The basic habitat of the salt marsh harvest mouse has been described as *Sarcocornia* (pickleweed)-dominated vegetation (Dixon 1908; Fisler 1965 cited in USFWS 2010, 2013). Other highly important habitat considerations include high tide/flood refugia of emergent *Grindelia* (gumplant); both at the upper edge of the marsh and within mature marshes, even at the highest high tides), seasonal use of terrestrial grassland, exploitation of suboptimal habitats, and habitat selection in brackish marsh vegetation where *Sarcocornia* is a relatively minor component, as often is the case in Suisun Bay marshes.

The Smith *et al.* (2014) publication suggests that behavioral flexibility of the salt marsh harvest mouse may allow it to adapt to using diked wetlands. The Smith *et al.* (2019) publication also suggests that salt marsh harvest mice make use of diked wetlands and that as climate change and sea level rise are predicted to threaten coastal marshes, a recovery strategy for salt marsh harvest mice could incorporate managed wetlands.

Telemetry studies of the northern salt marsh harvest mouse at Mare Island Marshes found a mean home range size of 0.21 hectare (0.52 acre), and a mean linear distance moved of 11.9 meters (39 feet) in 2 hours (Bias and Morrison 1999). Most movements occurred in June, and fewest movements occurred in November. Mare Island mean home ranges were much larger than those estimated by Geissel et al. (1988) for the southern subspecies, which were no greater than 0.15 hectare (0.37 acre). Due to different measuring techniques, no comparison between the subspecies regarding mean linear distance traveled can be made. Bias and Morrison (1993 cited in USFWS 2010, 2013; 1999) found that movements through open habitats were not restricted to rare or extraordinary events, however, Shellhammer (in litt. 2009 cited in USFWS 2010) identified that generally mice do not cross large areas of open habitats, assuming that "open habitats" mean "open space" or unvegetated habitat.

Male salt marsh harvest mice are generally sexually active from April through September, while the female breeding season extends from March through November for the northern subspecies, and May through November for the southern subspecies (Fisler 1965 cited in USFWS 2010, 2013). Bias and Morrison (1993 cited in USFWS 2010, 2013) suggest that the breeding season of the Mare Island population (northern subspecies) extends from August through November; more than 30 percent of the females trapped were pregnant during September and October.

Additional information about the salt marsh harvest mouse biology and ecology is available in the Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California, available at: https://ecos.fws.gov/docs/recovery_plan/TMRP/20130923_TMRP_Books_Signed_FINAL.pdf (USFWS 2013a).

Population Status

There is currently no USFWS range-wide salt marsh harvest mouse monitoring program or protocol nor habitat suitability metrics available to evaluate recovery progress of the species and its habitat. For the 2021 5-year review, the USFWS reviewed new information about the spatial distribution and abundance of mice based on various reported mouse survey results from 2010 through 2019.

The 2021 5-year review noted that while capture efficiency values in fluctuate annually for almost every surveyed site, some possible trends appear. Excluding sites with two or fewer years of data, there appear to be positive population trends from 2010 to 2019 for several sites, including: Eden Landing in the Central/Southern San Francisco Bay Recovery Unit; Napa Sonoma Marsh in the San Pablo Bay Recovery Unit; and Grizzly Island East, Ponds 1-5, and Goodyear Slough in the Suisun Bay Area Recovery Unit. There also appear to be negative population trends at several sites, including: Sonoma Creek 1/Strip Marsh West (formerly Sonoma Baylands)/Tubbs Island Setback/Lower Tubbs Island in San Pablo Bay Recovery Unit; and Hill Slough Wildlife Area/Ponds 1 and 2 (and Ponds 4/4a and Areas 8 and 9), Bradmoor Island/California Water Association, Denverton, Lower Joice Island/Joice Island Unit, and East Border of Grizzly Island plus Crescent Unit in the Suisun Bay Area Recovery Unit. It is noted, however, that for several of the Suisun Bay Area Recovery Unit, sites listed as having apparent negative population trends from 2010 to 2019, the lower value in 2019 followed what appears to have otherwise constituted a positive trend through 2018.

Habitat loss that threatens the salt marsh harvest mouse is due to filling, diking, subsidence, changes in water salinity, non-native species invasions, sea-level rise associated with global climate change and pollution. In addition, habitat suitability of many marshes is further limited by small size, fragmentation, and lack of other vital features such as sufficient escape habitat.

Several marsh restoration projects in the north and south San Francisco Bay and in Suisun Marsh that may increase habitat for the salt marsh harvest mouse are in various stages of implementation (USFWS 2021).

For the most recent comprehensive assessment of the species' range-wide status, please refer to the salt marsh harvest mouse 5-Year Review, available at https://ecos.fws.gov/docs/tess/species_nonpublish/3643.pdf (USFWS 2021).

Recovery Plan Information

The USFWS published the Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California in 2013 (USFWS 2013a). The basic strategy for recovery of the salt marsh harvest mouse is the protection, enhancement, and restoration of extensive, well-distributed habitat suitable for the species. There are short- and long-term components of the general recovery strategy, as well as specific geographic elements. Both interim and long-term components are necessary; neither alone is sufficient to recover the salt marsh harvest mouse. We have identified 5 recovery units: Suisun Bay Area, San Pablo

Bay, Central/South San Francisco Bay, Central Coast, and Morro Bay. Recovery criteria comprise a combination of numerical demographic targets and measures that must be taken to directly ameliorate or eliminate threats to the species in the appropriate subset of the above recovery units.

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San Bernardino Kangaroo Rat and its Critical Habitat

Listing Status

The San Bernardino kangaroo rat (SBKR) was emergency listed as endangered on January 27, 1998 (63 FR 3840), and formally listed as endangered September 24, 1998, primarily due to habitat loss associated with agricultural, urban, and industrial development and small population size (63 FR 51005).

Critical habitat for SBKR was first proposed on December 8, 2000 (65 FR 77178) and designated on April 22, 2002 (67 FR 19812). Critical habitat for SBKR was subsequently re-proposed on June 19, 2007 (72 FR 33808), and a revised designation of the critical habitat was made final on October 17, 2008 (73 FR 61936). Following a 2009 lawsuit challenging the 2008 critical habitat designation, the court vacated the 2008 designation and reinstated the 2002 critical habitat designation on January 8, 2011.

Life History and Habitat

In the final listing rule, we considered that the current range likely encompassed 9,797 acres of habitat with the appropriate soils and vegetative cover to be occupied to some degree by the subspecies as follows: 3,861 acres in the Santa Ana River; 5,161 acres in Lytle and Cajon Creeks; and 775 acres in the San Jacinto River (Service 2009).

As identified in the final listing rule, habitat for the SBKR has been severely reduced and fragmented by development, aggregate mining, and related activities in the San Bernardino and San Jacinto valleys (Service 2009). As a result of listing, the Service is working cooperatively with other Federal agencies and local aggregate mining operators to conserve and manage habitat for the species. Thus, the direct threats posed to SBKR from aggregate mining are being addressed. Development within floodplain habitat will continue to increase as a result of population growth within western San Bernardino County and the demand for a larger water supply in southern California. An overall reduction in the amount of habitat available to the San Bernardino kangaroo rat and greater habitat fragmentation will continue to occur. Because of the high level of habitat loss (habitat already reduced by 96 percent by the time the San Bernardino kangaroo rat was emergency listed), the Service's conservation and recovery strategy is to conserve as much remaining habitat as possible. Management and coordination with Federal, State, and local government agencies and mining operations will be needed to protect SBKR from habitat fragmentation and loss due to urban development, off-highway vehicle use, trash dumping, aggregate mining, and an increase in predators such as domestic and feral cats associated with urban development (Service 2009).

Population Status

Please see our 2009 5-year review for a status of the SBKR population (Service 2009).

Recovery Plan Information

The Service completed an updated 5-year review (Service 2020) and has initiated work on a draft recovery plan for SBKR. In the interim, the 2020 5-year review contains the following recommendations for actions to assist in SBKR recovery:

- Create and implement a protocol for range-wide surveys and monitoring;
- Conduct a Population Viability Analysis to enhance our understanding of population dynamics and provide probabilities of persistence to aid in recovery planning;
- Conserve and restore occupied habitat throughout the range of the species;

- Create a genetic management plan to prevent loss of genetic variation and maintain or improve adaptive potential over time;
- Restore and protect other potentially suitable habitat including upland refugia habitat throughout the range of the species;
- Use management tools to improve connectivity and maintain/restore small populations;
- Utilize outreach and other techniques to limit reactional threats and improve public awareness and support; and
- Continue to investigate reestablishment and augmentation as tools to increase abundance and expand distribution in the wild.

Critical Habitat

Four units of designated critical habitat occur over 33,295-acres in Riverside and San Bernardino counties and are comprised of the Santa Ana River, Lytle and Cajon Creek, San Jacinto River-Bautista Creek, and the Etiwanda Alluvial Fan and Wash units (67 FR 19812). The 2002 designation of SBKR critical habitat includes four physical and biological features. These include:

1. Soil series consisting predominantly of sand, loamy sand, sandy loam, or loam.
2. Alluvial sage scrub and associated vegetation, such as coastal sage scrub and chamise chaparral, with a moderately open canopy.
3. River, creek, stream, and wash channels; alluvial fans; floodplains; floodplain benches and terraces; and historic braided channels that are subject to dynamic geomorphological and hydrological processes typical of fluvial systems within the historic range of the kangaroo rat; these areas may include a mosaic of suitable and unsuitable soils and vegetation that either:
    a. occur at a scale smaller than the home range of the animal, or
    b. form a series of core areas and linkages between them.
4. Upland areas proximal to floodplains with suitable habitat (e.g., floodplains that support the soils, vegetation, or geomorphological, hydrological, and wind-driven processes essential to this species).

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Stephen's Kangaroo Rat

Listing Status

The Stephen's kangaroo rat (SKR) is a rare mammal in the family Heteromyidae associated with grasslands and open scrub 1 vegetation on loamy soils in southern California, or more specifically western Riverside County and northern San Diego County. Since its listing under both the California (1971) and US (1988) Endangered Species Acts, intensive conservation planning efforts have established numerous 2 ecological reserves for SKR and other species.

Life History and Habitat

SKR is a nocturnal, burrowing, seed-eating rodent of open "forblands" or "California prairie" (but usually classified as grasslands, which may be misleading) and sparse scrub, on gentle slopes with loamy 4 soils, in cismontane Riverside and San Diego counties. Like other kangaroo rat species, it can survive with little or no free water due to highly efficient metabolic water production and use. It feeds primarily on the seeds and shoots of grasses, forbs, and shrubs, supplemented occasionally with insects. It uses external, fur-lined cheek pouches to transport seeds from collection sites to burrows or caches, which presumably minimizes moisture loss via the mouth. Due to its kangaroo-like movements, SKR requires open ground conditions with some exposed soil, which it also uses for "dust bathing" to control external parasites, remove excess oils from its pelage, and communicate via scents. Kangaroo rats also "foot drum" to communicate over longer distances.

SKR are relatively sedentary, with young usually establishing home ranges close to where they were born (generally within ~30m) but are capable of long-distance dispersal movements (>400m or perhaps even >1km) in appropriate habitats or along dirt roads or trails. Female SKR tend to occupy home ranges with minimal intrasexual overlap, whereas the larger home ranges of males tend to overlap with one another and with multiple females. Reproductive rates are rather low for a rodent of their body size, but females are capable of producing multiple (2-3) litters in years with favorable conditions. SKR population density can vary substantially over space and time, and populations tend to be patchily distributed within suitable habitat. SKR sometimes co-occur with the more widespread Dulzura kangaroo rat (DKR; *Dipodomys simulans*), at ecotones between grassland and shrubland but SKR is thought to be competitively dominant and may restrict the DKR to shrubbier cover where the two species come in contact (Bleich and Price 1995). SKR are preyed upon by a variety of snakes, owls, weasels, and coyotes, and perhaps occasionally by badgers. Their burrow systems typically have 3-5 burrow entrances, are often improved from those first created by pocket gophers, and may be shared with a wide array of other rodents, invertebrates, and reptiles. Due to its foraging effects and burrowing activities, SKR may be considered a "keystone species" that has a strong influence on their ecological community via effects on vegetation composition and structure (Brock and Kelt 2004a) and their maintenance of burrow systems also used by other species.

SKR is a habitat specialist that occupies open grasslands 3 with abundant native and non-native annual forbs, or sparse coastal sage scrub with shrub cover less than about 30%, and extensive bare ground for most of the year (Spencer et al. 2017). Before the rapid conversion to what is called California annual grasslands following introduction of livestock (cattle, sheep, and horses) to California, SKR habitat was more appropriately termed "California prairie," which probably provided superior habitat conditions to those found today. California prairies were dominated by a diverse and abundant array of native annual forbs (flowering herbaceous plants) between widely spaced native, perennial bunch grasses, especially purple needlegrass (*Stipa pulchra*) (Minnich 2008), (Stromberg et al. 2007). Field observations reveal that SKR are currently strongly associated with native and nonnative forb-dominated habitats that green up, flower, and set seed in spring (with April generally having maximum vegetation greenness and moistness), but then rapidly dry out and disarticulate over summer, leaving abundant open ground and bare soil conditions. This vegetative composition and dynamic now largely depends in some areas on the very cattle grazing that likely ravaged the perennial bunchgrasses and spurred an explosion of non-native annual grasses in southern California (Stromberg et al. 2007). Elsewhere, favorable SKR habitat conditions may be maintained by sheep grazing, fire, or other disturbance factors. Restoring original native vegetation conditions is generally considered infeasible due to the overwhelming competitive advantage of annual grasses, due to their dominance in the soil seed bank and ability to germinate before most native annual forbs. Nevertheless, understanding the nature of the SKR's original habitat can help managers achieve some of the characteristics that made it suitable, such as abundant forbs and lack of grass thatch. Typical SKR habitat today supports both native and non-native forbs, such as filaree (*Erodium* spp.), dove weed (*Croton setiger*), tarplant (*Deinandra fasciculata*, *D. paniculata*), and goldfields (*Lasthenia* spp.).

The SKR's diet is dominated by seeds produced by such annual forbs; and the open, bare-ground conditions that result as the forbs dry out and disarticulate over summer creates the open, bare soil conditions that SKR prefer for their highly evolved modes of locomotion (e.g., bounding), grooming and communication (e.g., "sand-bathing"), and other peculiarities of their ecology. In contrast, the dense thatch buildup of annual Mediterranean grasses, especially where disturbance by grazing or fire is absent, impedes SKR movements and their ability to forage for seeds or interact with one another. Although SKR thrive in habitats devoid of shrubs and dominated by spring annuals, it is possible that sparse shrubs (e.g., *Artemisia, Eriogonum*) and summer annuals (e.g., *Croton*, *Deinandra*) may contribute a greater diversity of seasonal foods for SKR. The soils in occupied SKR habitat are usually loamy and friable, which facilitates burrowing. Rarely are soils used by SKR high in clay or rock content, which make burrowing difficult, or very sandy, in which burrows may collapse. SKR will use suboptimal soils (e.g., higher in clay or rock content) where better soils are not available and other factors contribute to favorable conditions. For example, pocket gophers and ground squirrels are stronger burrowers than kangaroo rats, and their burrowing in heavier clay soils can facilitate later use by SKR.

Population Status

SKR has a very restricted geographic range for a rodent of its body size. Historically it was found in western Riverside County, northern San Diego County, and extreme southwestern San Bernardino County. It currently occurs in widely scattered grasslands, perhaps more appropriately called forbland or California prairie, and very open scrub habitats in western Riverside and northern San Diego counties. Scattered populations are found across the Perris Valley and the Anza area in Riverside County; on Marine Corps Base Camp Pendleton and Fallbrook Naval Weapons Station in northwest San Diego County; and on scattered inland grasslands in the Warner Basin/Lake Henshaw area, the Santa Maria Valley (Ramona Grasslands), and in and near Rancho Guejito near Escondido. Former populations in southwestern San Bernardino County and in the Oceanside/Bonsall area of San Diego County are apparently extirpated, as are numerous other historical sites that have been lost to development. Most remaining populations are separated by human development and other unsuitable habitats, and many are demographically and genetically isolated from others.

The current distribution of suitable SKR habitat and populations, along with existing information on their genetic structure, suggest that the rangewide population of SKR functions as a collection of regional metapopulations, with little if any gene flow between them. For example, SKR on Camp Pendleton and Fallbrook Naval Weapons Station may comprise one isolated metapopulation, and SKR in inland San Diego County (Rancho Guejito, Ramona, and Warner Basin) may represent several isolated subpopulations or possibly one or two metapopulations. Researchers at San Diego Zoo's Institute for Conservation Research (ICR) have demonstrated that SKR allelic richness (a measure of genetic diversity) declines as one moves southward from the northern Perris Valley region to the southern populations in San Diego County, suggesting that the species expanded southward from an ancestral population in the northern part of the range.

These results also suggest that SKR once had a more continuous distribution that has undergone recent habitat fragmentation, such that the current metapopulation structure of SKR is a relatively recent phenomenon created by human land-use changes. Reduced dispersal and genetic mixing have led to recent genetic isolation and local genetic drift (Shier and Navarro 2016). Ongoing research is exploring changes in historic and contemporary connectivity across the range of SKR. Linking patterns of genetic differentiation to landcover features will reveal how habitat fragmentation has impacted the species and inform mitigation and translocation efforts.

Recovery Plan Information

In 1997 the US Fish and Wildlife Service produced a Draft Endangered Species Recovery Plan for SKR (U.S. Fish and Wildlife Service 1997), but the plan was never finalized. Since then, scientists and managers have learned much more about the species and its conservation needs. In addition, recent technological advances allow for new and better ways of mapping and monitoring habitat conditions at fine resolution using satellite imagery (Spencer and Romsos 2019).

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Tipton Kangaroo Rat

Listing Status

The Service listed the Tipton kangaroo rat as endangered on July 8, 1988 (Service, 1988). The Service has not designated critical habitat for this species.

Life History and Habitat

The Tipton kangaroo rat is one of three recognized subspecies of the more widely spread San Joaquin kangaroo rat (*Dipodomys nitratoides*) (Best, 1991). The three subspecies include the Tipton, Fresno (*Dipodomys nitratoides exilis*), and short-nosed (*Dipodomys nitratoides brevinasus*) kangaroo rats (Best, 1991). Recent evidence has confirmed significant morphological differences that distinguish these three subspecies (Patton *et al.,* 2019).

The Tipton kangaroo rat lives in underground burrow systems. Their burrows are located in slightly elevated mounds, the berms of roads, canal embankments, railroad beds, and bases of shrubs and fences where windblown soils accumulate above the level of the surrounding terrain. They establish their burrows in places that are unlikely to flood. Researchers believe saltbush scrub and valley sink scrub vegetative communities are important predictors for the Tipton kangaroo rat (Service, 1998); however, the exact micro-habitat characteristics needed to support populations are not well understood (Service, 2020).

The Tipton kangaroo rat has dark yellowish-buff fur covering its body, with white stripes on its stomach and across its hips. They have a shortened neck and a large, flattened head, as well as dark whisker patches and small, rounded ears. It has a long, tufted tail that measures 4.8 to 5.1 inches (125 to 130 millimeters) long. The tail helps them balance as they hop. They have strong claws on their front feet for digging.

Tipton kangaroo rats eat mostly seeds, with small amounts of green vegetation and insects supplementing their diet when available. Unlike some kangaroo rat species, Tipton kangaroo rats do not hide seeds for later consumption. Instead, they forage for food frequently throughout a large home-range, sifting through the upper layers of sand and soil for fallen seeds.

Tipton kangaroo rats have a short lifespan; they might only live between 10 to 12 months of age and rarely survive longer than three years. Little is known about their reproduction in the wild. Due to their short life cycle, they are particularly sensitive to stressors that might interrupt their life cycle (e.g., interspecific competition, increase of non-native grasses). Mating appears to begin in the winter. Most females seem to have one litter per year, although some have two or more. Young are born in burrows.

Habitat loss due to agricultural development throughout the subspecies' range is the main threat to the survival of the Tipton kangaroo rat. Other threats include small population size, habitat fragmentation, climate change, and broad-scale application of rodenticides.

Population Status

The Tipton kangaroo rat lives in arid areas in the San Joaquin Valley. Kangaroo rats were once abundant across the valley floor, but the conversion of natural lands to agricultural and urban uses reduced that habitat. Today, the Tipton kangaroo rat is extremely rare and small populations are known to live in limited locations, including the Kern National Wildlife Refuge, Delano, and other scattered areas within Kern, Kings, and Tulare Counties. The largest Tipton kangaroo rat populations exist in areas of contiguous suitable habitats, such as the Lokern Ecological Reserve and adjacent lands (Service, 2020). However, many of the smaller populations have declined or become locally extinct within the past 10 years (Service, 2020).

Recovery Plan Information

The Tipton kangaroo rat's recovery strategy is described in the Recovery Plan for Upland Species of the San Joaquin Valley, California (Service, 1998). The downlisting and delisting criteria for the Tipton kangaroo rat include the following (Service, 1998; Service, 2020):

Downlisting

1. Protection of occupied habitat:
    a. Three or more distinct areas with 4,940 acres (2,000 hectares) or more of contiguous, occupied habitat, and
    b. 30% each or more of the minimum acreage in public or conservation ownership.
2. A management plan that includes the survival of the Tipton kangaroo rat as an objective has been approved and implemented for all protected areas identified as important to the continued survival of the subspecies.
3. Population monitoring in specified recovery areas shows that populations are stable or increasing through a precipitation cycle.

Delisting will be considered when, in addition to the criteria for downlisting, all of the following conditions have been met:

1. A total of 22,230 acres (9,000 hectares) or more of occupied habitat is in public or conservation ownership, and
2. Protected sites have a mean density of four kangaroo rats per acre (10 per hectare) during a complete precipitation cycle.

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Birds

California Ridgway's Rail

Listing Status

The California Ridgway's rail (*Rallus obsoletus obsoletus*) was federally listed as endangered on October 13,1970 (35 FR 16047, USFWS 1970). Critical habitat has not been proposed or designated.

Based on the work of Maley and Brumfield (2013), the American Ornithologist's Union (AOU) Committee on Classification and Nomenclature accepted in its 55th Supplement to the AOU Check-list of North American Birds (Chesser *et al.* 2014), revisions to the specific assignments under the genus *Rallus*. Among those changes, the species *R. obsoletus* (Ridgway's rail) and *R. crepitans* (Clapper rail) were split from *R. longirostris*, and *R. longirostris* was deleted. The AOU Check-list of North American Birds has not addressed subspecies treatments since its 5th edition was published in 1957. Rather, the AOU refers to the listing of the Birds of North America by the Cornell Lab of Ornithology for subspecies treatments. In its subspecies treatments for *R. obsoletus* (Eddelman and Conway 2018), the Cornell Lab of Ornithology included a change from California clapper rail (*Rallus longirostris obsoletus*) to California Ridgway's Rail (*Rallus obsoletus obsoletus*). The USFWS formally adopted the taxonomic and nomenclature changes described above in 2023 (88 FR 49310, USFWS 2023); previous USFWS documents may refer to the species as the California clapper rail (*Rallus longirostris obsoletus*).

Life History and Habitat

Historically, the California Ridgway's rail was abundant in all tidal salt and brackish marshes in the San Francisco Bay vicinity, as well as in all of the larger tidal estuaries from Marin to San Luis Obispo counties. Current distribution is restricted almost entirely to the marshes of the Bay Area and where the only known breeding populations occur. California Ridgway's rails occur almost exclusively in tidal salt and brackish marshes with unrestricted daily tidal flows, adequate invertebrate prey food supply, well developed tidal channel networks, and suitable nesting and escape cover for refuge during extreme tides. They exhibit strong site fidelity and territorial defense and are considered sensitive to disturbance. They tend to have relatively small average home ranges of 4.7 hectares (11.6 acres) and core use areas of 0.9 hectare (2.2 acres).

In south and central San Francisco Bay, and along the perimeter of San Pablo Bay, rails typically inhabit salt marshes dominated by *Sarcocornia pacifica* and *Spartina foliosa*. *Spartina* ssp. dominates the lower marsh zone (marsh plain) throughout the south and Central Bay (DeGroot 1927, Hinde 1954, Harvey 1988). *Sarcocornia pacifica* dominates the middle and sometimes upper marsh zone throughout the South and Central Bay, with *Distichlis spicata*, *Jaumea carnosa* (fleshy jaumea), *Frankenia salinia* (alkali-heath), and others mixing with occasional *Sarcocornia pacifica* in the high marsh zone. *Grindelia stricta* var. *angustifolia* occurs along the upper edge of tidal sloughs throughout the entire San Francisco Bay Estuary.

In the North Bay, California Ridgway's rails also occur in tidal brackish marshes that vary significantly in vegetation structure and composition, ranging from salt-brackish marsh to fresh-brackish marsh transitions. *Bolboschoenus maritimus* (alkali bulrush), an indicator of salt-brackish marsh transitions, is sub-dominant to dominant in low marsh and lower middle marsh plains. *Schoenoplectus acutus* and *Schoenoplectus californicus* (tules), *Schoenoplectus americanus* (Olney's bulrush), and *Typha* spp. dominate the low marsh zone of fresh-brackish marsh transitions, while fresh-brackish marsh plain vegetation is a diverse, patchy mixture of dominant *Distichlis spicata*, *Jaumea carnosa*, salt rush (*Juncus arcticus* ssp. *balticus*, *Juncus lesueurii*), and numerous native and non-native herbs, grasses, and sedges. *Grindelia stricta* var. *angustifolia* (and its hybrid *Grindelia* x *paludosum* in Suisun Marsh) is the widespread dominant of high marsh vegetation in brackish marshes today, but it occurs with other tall, dense sub-shrubby or herbaceous native vegetation along marsh edges and creek banks, such as *Baccharis douglasii* (salt marsh *baccharis*), *Euthamia occidentalis* (goldenrod), *Achillea millefolium* (yarrow), *Scrophularia californica* (bee-plant), and asters (*Symphyotrichum lentum*, *Symphyotrichum chilensis*, and intermediates, *Symphyotrichum sublantus* var. *ligulatus*; now uncommon). The historically diverse high brackish marsh vegetation probably provided ample high tide flooding refuges for California Ridgway's rails.

The breeding period of the California Ridgway's rail is prolonged. Pair bonding and nest building are generally initiated by mid-February. Nesting may begin as early as late February or early March (Evens and Page 1983 as cited in USFWS 2013a), and extend through July in the South Bay, and into August in the North Bay (DeGroot 1927). The end of the breeding season is typically defined as the end of August, which corresponds with the time when eggs laid during re-nesting attempts have hatched and young are mobile.

Additional information about the California Ridgway's rail biology and ecology is available in the Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California, available at: https://ecos.fws.gov/docs/recovery_plan/TMRP/20130923_TMRP_Books_Signed_FINAL.pdf (USFWS 2013a).

Population Status

There is currently no USFWS range-wide California Ridgway's rail monitoring program or protocol nor habitat suitability metrics available to evaluate recovery progress of the species and its habitat. The 2020 5-Year Review used the Invasive *Spartina* Project habitat information and survey data to use as indices of both site-level and range-wide changes in rail population abundance and habitat suitability. Call count data was used as an index/estimate of annual rail abundance and trend at surveyed sites and the habitat assessment information as an index/estimate of trend for the area of habitat described as suitable for surveyed sites. The USFWS did not attempt to estimate or model rail densities or abundance for unsurveyed areas. Accordingly, because the call count surveys and habitat assessments did not include all possible habitat, we consider our estimates of population abundance and habitat area to be minimum estimates and actual population abundance is likely higher.

Overall, the estimated range-wide California Ridgway's rail population has increased since the 2013 5-Year Review. The 2013 5-Year Review and Recovery Plan referenced the Liu et al. (2009) estimate of an average population of 1,426 rails between 2005 and 2008 (for comparison, the USFWS currently estimated average for the same time period was 890 rails). The index estimated range-wide annual population for 2011 was 899 rails and for 2018 was 1,192 rails (USFWS 2020).

At a recovery unit scale, the increase since 2011 in population estimate was observed in both the San Pablo Bay and Central/South San Francisco Bay Units (USFWS 2020). The San Pablo Bay Recovery Unit had some increase in rail numbers between 2011 and 2018, with 290 birds in 2011 and 353 birds in 2018, but ended the time period nearly slightly lower proportionately, supporting about 32 percent and 30 percent of the range-wide population in 2011 and 2018, respectively (USFWS 2020). The Central/South San Francisco Bay unit experienced a greater increase in rail numbers between 2011 and 2018, with 607 birds in 2011 and 839 birds in 2018. The proportion of the range-wide population in the Central/South San Francisco Bay Recovery Unit also increased slightly, supporting about 67 percent and 70 percent of the range-wide population in 2011 and 2018, respectively (USFWS 2020). The Suisun Bay Recovery Unit did not experience an increase, with rail counts in that unit remaining at or near zero for the entire data series (USFWS 2020). It is noted that establishment of sustainable populations in the Suisun Bay

Unit at levels prescribed in the Recovery Plan may be considered indicative of the species occupying its full range under optimal habitat and population conditions (USFWS 2013a, 2013b).

The 2020 5-Year Review analysis suggests that while the California Ridgway's rail population appears to have increased across both the San Pablo Bay and Central/South San Francisco Recovery Units since the 2013 5-Year Review, the distribution of rails has become increasingly concentrated to fewer sites and less habitat area. No change in the species' listing status was recommended in this 5-year review.

Threats to the species include, but are not limited to, habitat destruction and modification including the implementation of the Invasive *Spartina* Project and sea-level rise, low adult survivorship (ranging from 0.49 to 0.52), and predation of adults and eggs/nestlings.

For the most recent comprehensive assessment of the species' range-wide status, please refer to the California Ridgway's rail 5-Year Review, available at https://ecos.fws.gov/docs/five_year_review/doc6592.pdf (USFWS 2020).

Recovery Plan Information

The USFWS published the Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California on August 27, 2013 (USFWS 2013a). Recovery of the California Ridgway's rails requires a combination of interim and long-term actions. Interim actions are those necessary to maintain current populations, while long-term actions focus on recovering the species throughout its range. Interim actions involve monitoring current populations (number and distribution), non-native predator and invasive plant control, reducing human disturbance and protection of existing habitat. Long-term actions involve large-scale tidal marsh restoration and implementation of long-term management plans.

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California Spotted Owl, Coastal Southern California DPS

Listing Status

The coastal southern California distinct population segment (DPS) was proposed to be listed as an endangered species on February 23, 2023 (88 FR 11600).

Life History and Habitat

In coastal and southern California, spotted owls are found in riparian/hardwood forests and woodlands, live oak/big cone fir forests, and redwood/California laurel forests (Gutiérrez et al. 2017). In southern California, vegetation types differ relative to the Sierra Nevada, and what is considered a large tree in southern California may not be comparable to what is considered a large tree in the Sierra Nevada. However, California spotted owls in southern California still select for territories containing larger trees (LaHaye et al. 1997) and predominantly closed canopy cover (Smith et al. 2002). The spotted owl breeding season begins in mid-February, and the juvenile dependency period can last through mid-September; nesting generally starts earlier at lower elevations (Gutiérrez et al. 2020). During the breeding season, spotted owls tend to spend the majority of their time at activity centers of around 299 acres (Verner et al. 1992; Berigan et al. 2012). Activity centers are the areas where California spotted owls nest, roost, and forage (Verner et al. 1992; Gutiérrez et al. 2017).

Population Status

In the Coastal-Southern California DPS, impacts from wildfire are at very high magnitude, with all of the DPS considered to be at extreme fire risk. Fire analysis shows that 60 percent of the range of the Coastal-Southern California DPS burned between 1984 and 2021, including 17 percent at high severity. These high-severity fires in particular are removing the California spotted owl's needs of canopy cover, large trees, and habitat heterogeneity. Given that habitat in the Coastal-Southern California DPS is already fragmented and that there is limited evidence of movement between habitat patches, any habitat burned at high severity is less likely to be able to recover from high-severity fires (88 FR 11600).

Development has further degraded naturally fragmented habitat in the Coastal-Southern California DPS, and owls in this DPS are affected by ongoing drought conditions and tree mortality. In southern California, there are high development demands with wind farms and large reservoirs impacting connectivity within the California spotted owl's range, and riparian areas used by California spotted owls are being lost to water diversion. These threats are continuing to reduce the California spotted owl's needs of high canopy cover and large trees, both of which are already at low condition. Barred owls are currently only having a limited impact on this DPS (88 FR 11600).

Limited population data are available for this part of the range, but in the San Bernardino Mountains, occupancy of territories has declined by half (Tempel et al. 2022, pp. 16, 18). Additionally, there is little to no information about California spotted owls dispersing between mountain ranges in coastal or southern California. The number of owls in this part of the range is low. Therefore, what might be considered a stochastic event in the Sierra Nevada DPS leading to the removal of one or a few individuals from the population could have a much higher impact if it were to occur in the coastal-southern California DPS. Additionally, due to the highly developed nature of the areas between suitable patches of habitat in coastal and particularly southern California, there is no record of owls dispersing between occupied areas. All four analysis units in this DPS are currently declining (88 FR 11600).

Recovery Plan Information

The Coastal-Southern California DPS of California spotted owl is proposed for listing and therefore does not currently have a recovery plan in place.

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California Spotted Owl, Sierra Nevada DPS

Listing Status

The Sierra Nevada distinct population segment of the California spotted owl (CSO) was proposed as a threatened distinct population segment on February 23, 2023 (Service 2023).

Life History and Habitat

California spotted owls are considered to be long living (~16–23 years) with high adult survival and low reproductive output (Seamans and Gutiérrez 2007). CSO form monogamous pair bonds, although occasionally bonds may break and new bonds may form due to circumstances such as the death of a mate or low reproductive output with a previous mate (Gutiérrez et al. 1995). Pairs will defend a territory from neighboring pairs and vagrant owls, and they exhibit high territory fidelity (Gutiérrez et al. 1995).

Pairs do not necessarily breed every year, but they can breed in consecutive years. Spotted owls have a bet hedging reproductive strategy, in which owls may postpone reproduction until temporarily poor environmental conditions improve (Franklin et al. 2000, Gutiérrez et al. 2017). The number of young fledged annually per territorial female ranges from 0.478–0.988 (Blakesley et al. 2010). The probability of occupancy and successful reproduction by owls depends on whether owls successfully reproduced at the site the previous year, is higher at lower elevations, and is likely the result of differences in topographic and vegetation conditions (Hobart et al. 2019a).

In general, CSO live in mature, multistoried forests with complex structure, large trees, multi-layered high canopy cover, coarse woody debris, and species richness (Gutiérrez et al. 2017). National Forests within the range of CSO have established Protected Activity Centers (PAC) of about 300 acres that contain high quality habitat surrounding known CSO nesting sites. This habitat provides structures and characteristics required for nesting, roosting, and foraging. In the Sierra Nevada, a majority of CSO occur within mid-elevation ponderosa pine, mixed-conifer, white fir, and mixed-evergreen forest types, with few owls occurring in the lower elevation oak woodlands of the western foothills (Gutiérrez et al. 2017). Home ranges are ~1,000–3,000 acres, typically larger in the northern portion of the range, and can overlap between neighboring owls. Within a home range, the area closest to the nest site (500-2,000 acres) is more vigorously defended by the resident pair than the outer portion of the home range. During the breeding season (April–August), CSO on National Forests tend to spend most of their time within the 300-acre PAC (Verner et al. 1992, Berigan et al. 2012).

Occupancy, colonization, adult survival, and reproductive success in CSO are all positively associated with the proportion of structurally complex forests at multiple scales (Franklin et al. 2000, Blakesley et al. 2005, Tempel et al. 2014a, Tempel et al. 2016). Areas of high canopy cover provided by large (and tall) trees are important, especially near the nest site and within the core use area (Blakesley et al. 2005, North et al. 2017, Jones et al. 2018). CSO do not build their own nests but rely on old, large trees or snags with many defects like cracks, decay, open cavities, broken tops, and platforms. Most nest trees are a minimum of 30 inches diameter at breast height and average 45 inches diameter at breast height (Verner et al. 1992, North et al. 2000, Gutiérrez et al. 2017).

Low severity or patchy mixed severity wildfire is a historical natural occurrence throughout the range of the CSO, creating variable forest stands to which CSO are adapted. CSO residing in a mixed-ownership landscape preferentially forage in older forests near territory centers but select for diverse forest cover types (seral stages) at the periphery of territories (Atuo et al. 2019). Gaps and small openings of canopy cover are tolerated within a CSO territory, but there are generally no gaps around the nest stand (North et al. 2017). A heterogenous or variable mix of old forest and open areas leads to higher survival and reproduction than uniform old forest conditions because it supports sufficient prey (Franklin et al. 2000, Hobart et al. 2019a). CSO primarily prey upon a variety of small to medium sized mammals. CSO consume more northern flying squirrels (*Glaucomys sabrinus*) in higher elevation coniferous forests and more woodrats (*Neotoma spp.*) in lower elevation oak woodlands and riparian-deciduous forests (Verner et al. 1992, Hobart et al. 2019b).

Population Status

California spotted owls are continuously distributed throughout the forests of the western Sierra Nevada Mountains from Shasta County south to Tehachapi Pass (Gutiérrez et al. 2017), and sparsely distributed on the eastern side of the Sierra Nevada Mountains into western Nevada (Great Basin Bird Observatory 2017). The distribution of the northern spotted owl transitions to the range of the California spotted owl south of the Pit River to just north of Lassen Peak and interbreeding between the two subspecies occasionally occurs (Barrowclough et al. 2011, Haig et al. 2004, Hanna et al. 2018). CSO live from about 1,000 – 7,700 feet in elevation in the Sierra, and up to 8,400 feet in southern California (Verner et al. 1992).

There has not been a range-wide population study, so most of our understanding of population trends comes from a few long-term studies. Although there is no information regarding either historical population sizes or estimates for minimum viable population sizes, CSO populations have declined in the study areas in three national forests in the Sierra Nevada, but not in the Sequoia Kings Canyon National Park study area (Tempel et al. 2014b; Conner et al. 2013, 2016; LaHaye et al. 2004). The Service found that currently most CSO populations in the Sierra have low or moderate resiliency (Service 2022). Threats to the CSO include habitat loss and degradation from wildfire, forest management practices, human development, and other forms of disturbance; competition from the invasive barred owl; effects of drought and climate change; and secondary ingestion of rodenticides used in the illegal cultivation of marijuana (Service 2019, Gutiérrez et al. 2017).

Recovery Plan Information

There is not a recovery plan for the species.

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Coastal California Gnatcatcher and its Critical Habitat

Listing Status

The coastal California gnatcatcher (gnatcatcher) was federally listed as threatened on March 30, 1993. The primary threat was habitat loss associated with development (58 FR 16742). Critical habitat was designated on December 19, 2007 (72 FR 72010).

Life History and Habitat

The California gnatcatcher is primarily insectivorous, non-migratory, and exhibits strong site tenacity (Atwood 1990). Diet deduced from fecal samples resulted in leaf- and plant-hoppers and spiders predominating in the samples. True bugs, wasps, bees, and ants were only minor components of the diet (Burger et al. 1999). Gnatcatcher adults selected prey to feed their young that was larger than expected given the distribution of arthropods available in their environment. Both adults and young consumed more sessile than active prey items (Burger et al. 1999).

The range and distribution of the gnatcatcher is closely aligned with coastal scrub vegetation. This vegetation is typified by low (less than 3 feet), shrub and sub-shrub species that are often drought deciduous (Service 2010). The subspecies tends to occur most frequently within California sagebrush (Artemisia californica) -dominated stands on mesas, gently sloping areas, and along the lower slopes of the coast ranges (Atwood 1990). The gnatcatcher occurs in high frequency and density in scrub with an open or broken canopy while it is absent from scrub dominated by tall shrubs and occurs in low frequency and density in low scrub with a closed canopy (Weaver 1998). Gnatcatchers also use chaparral, grassland, and riparian habitats where they occur adjacent to sage scrub (Campbell et al. 1998). The use of these habitats appears to be most frequent during late summer, autumn, and winter, with smaller numbers of birds using such areas during the breeding season. These non-sage scrub habitats are used for dispersal, but data on dispersal use are largely anecdotal (Campbell et al. 1998).

The gnatcatcher is nonmigratory and defends breeding territories ranging in size from 2 to 14 acres. The home range size of the gnatcatcher varies seasonally and geographically, with winter season home ranges being larger than breeding season ranges and inland populations having larger home ranges than coastal. The breeding season of the gnatcatcher generally extends from late February through July (sometimes later), with the peak of nest initiations (start-ups) occurring from mid-March through mid-May (Service 2010).

Juveniles are dependent upon or remain closely associated with their parents for up to several months following departure from the nest and dispersal from their natal (place of birth) territory. Dispersal of juveniles generally requires a corridor of native vegetation that provides certain foraging and sheltering requisites and that connects to larger patches of appropriate sage scrub vegetation (Service 2010).

Population Status

The range of the gnatcatcher is coastal southern California and northwestern Baja California, Mexico, from southern Ventura and San Bernardino counties, California, south to approximately El Rosario, Mexico, at about 30 degrees north latitude, which is approximately the same as at listing (Service 2010). We don't have reliable estimates for the numbers of coastal California gnatcatchers across its range, but Winchell and Doherty (2008) estimated there were 1,324 (95 percent confidence interval: 976–1,673) gnatcatcher pairs over a 111,006-acre area on public and quasi-public lands of Orange and San Diego counties.

Available evidence indicates modification, curtailment, and destruction of gnatcatcher habitat has been occurring over the recent past and we anticipate these actions to continue over the foreseeable future due to development and wildfire. Regardless of the potential magnitude of the threat, the effects of development resulting from population growth in the region have been tempered in by implementation of regulatory mechanisms, especially the State's Natural Community Conservation Planning process and the Federal Habitat Conservation Plan process (Service 2010).

A genetic study published by Vandergast et al. (2019) assessed the genetic connectivity within the U.S. portion of the gnatcatcher's range. The study finds that gnatcatchers are retaining genetic connectivity and a large effective population size throughout most of the U.S. range. This study supports the current method of preserving "core and linkages" through local Habitat Conservation Plans as a strategy for conserving the gnatcatcher in southern California. Conversely, evidence of reduced connectivity and loss of genetic diversity was found within population aggregations within the northern portion of the subspecies' range (i.e., Ventura and Los Angeles counties) where urbanization has led to increasing habitat fragmentation and a loss of surrounding suitable habitat within 16 miles of those aggregations. This suggests further habitat loss, fragmentation, or degradation within the subspecies' range could lead to a loss of population connectivity and genetic diversity within the subspecies, as is evident from the emerging population structure within Ventura and Los Angeles counties (Vandergast et al. 2019).

Critical Habitat

The 11 designated critical habitat units for the coastal California gnatcatcher include 197,303 acres of Federal, State, local, and private land in Ventura, Los Angeles, Orange, Riverside, San Bernardino, and San Diego counties (72 FR 72010). Designated critical habitat includes habitat throughout the subspecies' range in a variety of climatic zones and vegetation types to preserve the genetic and behavioral diversity that currently exists within the subspecies. Physical and biological features of designated critical habitat for the coastal California gnatcatcher are those habitat components that are essential for the primary biological needs of foraging, nesting, rearing of young, intra-specific communication, roosting, dispersal, genetic exchange, or sheltering (72 FR 72010). These include:

1) Dynamic and successional sage scrub habitats (i.e., Venturan coastal sage scrub, Diegan coastal sage scrub, Riversidean sage scrub, maritime succulent scrub, Riversidean alluvial fan scrub, southern coastal bluff scrub, and coastal sage-chaparral scrub) that provide space for individual and population growth, normal behavior, breeding, reproduction, nesting, dispersal, and foraging; and
2) Non-sage scrub habitats such as chaparral, grassland, and riparian areas, in proximity to sage scrub habitats that provide space for dispersal, foraging, and nesting.

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Least Bell's Vireo and its Critical Habitat

Listing Status

The least Bell's vireo was federally listed as endangered on May 2, 1986 (51 FR 16474), driven by anthropogenic modification of the subspecies' riparian breeding habitat (e.g., through flood control, water impoundment and diversion, urban development, agricultural conversion, and livestock grazing) and because of reduced vireo nest productivity (i.e., through anthropogenically elevated levels of brood parasitism by brown-headed cowbirds (*Molothrus ater*)). Critical habitat was designated on February 2, 1994 (59 FR 4845).

Life History and Habitat

Least Bell's vireos are obligate riparian breeders, typically inhabiting structurally diverse woodlands along watercourses. They occur in several riparian habitat types, including cottonwood-willow woodlands/forests and mule fat scrub, plus also mesquite woodlands in the deserts; nesting and foraging may sometimes also occur in neighboring upland areas. Two features that appear to be essential: (1) the presence of dense cover within 3-6 feet of the ground, where nests are typically placed, and (2) a dense, stratified canopy for foraging (Service 1998). Although least Bell's vireos typically nest in willow-dominated areas, plant species composition does not appear to be as important a determinant of nesting site selection as habitat structure.

The least Bell's vireo exhibits year-round diurnal activity and is known to be a nocturnal migrant (Brown 1993). Least Bell's vireos are insectivorous, preying on a wide variety of insects, including bugs, beetles, grasshoppers, moths, and particularly caterpillars (Service 1998). Vireos arrive in southern California breeding areas by mid-March to early April, with males arriving before females and older birds arriving before first-year breeders (Service 1998). Vireos generally remain on the breeding grounds throughout the summer and fall, sometimes until late September, although some post-breeding migration may begin as early as late July (Service 1998). Male vireos establish and defend breeding territories through singing and physically chasing intruders, with territories typically ranging in size from 0.5 to 7.5 acres (Service 1998).

Population Status

With an estimated 2,968 least Bell's vireo territories in the United States as of 2006, the number of least Bell's vireo territories has increased 10-fold since listing in 1986, when only 291 territories were known. Existing territories occur in San Diego, Riverside, Orange, San Bernardino, Los Angeles, Ventura, Santa Barbara, Inyo, and Kern counties, with infrequent nesting in Monterey, San Benito, and Stanislaus counties (Service 2006).

The federal listing of least Bell's vireo has helped to significantly reduce further impacts due to urbanization, and agricultural practices and grazing have otherwise declined. In addition, nonnative plant removals have helped restore habitat. Cowbird brood parasitism continues to be a significant threat to the vireo. Cowbird trapping in vireo breeding areas has proven a successful tool to halt vireo population declines over the short term, but trapping may not be the best method for long-term recovery of the vireo. It remains unclear as to the best way to manage this threat and additional research is needed to resolve this issue (Service 2006).

A relatively recent threat has emerged that has the potential to significantly impact least Bell's vireo nesting throughout its range. A disease complex involving two species of ambrosia beetles – the polyphagous shot hole borer (*Euwallacea* sp. 1) and Kuroshio shot hole borer (*Euwallacea* sp. 5), a mix of associated fungi (Lynch et al. 2016), and other pathogens are causing widespread damage to trees in riparian ecosystems throughout southern California (Eskalen et al. 2013). For example, vireo-occupied habitat in the Tijuana River (Recovery Unit 1) was infested and an estimated 140,000 trees or 35 percent of the trees showed extensive damage from the disease complex (Boland 2016). However, it is not clear whether the effects of shot hole borer infestations will result in long-term impacts to least Bell's vireo habitat. For example, there has been riparian vegetation regrowth in the effected portions of the Tijuana River, and while the regrown trees have not been reinfested by shot hole borers, there is concern that they may in the future (Boland and Uyeda 2020).

Critical Habitat

Designated critical habitat for least Bell’s vireo encompasses a total of about 38,000 acres at 10 localities in portions of 6 counties in southern California: Santa Barbara, Ventura, Los Angeles, San Bernardino, Riverside, and San Diego. The physical and biological features of designated critical habitat include riverine and floodplain habitats (particularly willow-dominated riparian woodland with dense understory vegetation maintained, in part, in a non-climax stage by periodic floods or other agents) and adjacent coastal sage scrub, chaparral, or other upland plant communities (59 FR 4845).

Recovery Plan Information

A draft recovery plan for least Bell’s vireo was released on May 6, 1998 (Service 1998); however, this plan has not been finalized. Although the least Bell’s vireo has not met the downlisting goals of the draft recovery plan for several hundred or more breeding pairs of least Bell’s vireo at all 11 identified sites, the overall population trend since the time of the listing for 10 of the 11 sites has been positive. In addition, despite the ongoing threat of brood parasitism by cowbirds, the least Bell’s vireo population has increased by 10-fold since the time of its listing. Cowbird trapping is well established at Camp Pendleton and within the Prado Basin of the Santa Ana River, which support the two largest concentrations of least Bell’s vireo. Wholesale loss and degradation of riparian habitats has halted, and riparian habitat restoration efforts are ongoing in many areas.

However, the following concerns persist: 1) further research is needed to address the primary threat of brood parasitism by cowbirds on the long-term recovery of the least Bell’s vireo; 2) without intensive habitat management and cowbird control at the main population sites, which is currently linked to section 7 consultations under the Act, or new evidence to suggest that vireo can persist without management intervention, vireo populations are likely to return to the low levels that necessitated its listing should intensive management cease; 3) a Population Viability Analysis determined that there was no imminent threat of extinction to the least Bell’s vireo, but that was based on maintaining reproductive rates correlated with extensive cowbird control; and 4) draft recovery goals established for delisting need further assessment based on current knowledge of population trends and species distribution throughout the State. Although least Bell’s vireo populations have increased in coastal southern California, in the desert regions in the eastern part of the state, and in northwestern Baja California, Mexico, the subspecies remains almost entirely absent from portions of its historical range in the Central Valley and coastal central California. The Service is currently evaluating the least Bell’s vireo’s listing status and will be publishing a 5-year status review in the future.

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Northern Spotted Owl and its Critical Habitat

Listing Status

The northern spotted owl was listed as threatened on June 26, 1990, due to widespread loss and adverse modification of nesting, roosting, and foraging habitat across the species' entire range and the inadequacy of existing regulatory mechanisms to conserve the owl (55 FR 26114). In 2019, the species' 5-year review documented its declining status (Service, 2019). After this review, the Service concluded that uplisting the northern spotted owl to 'endangered' was warranted, but precluded, by higher priority actions to amend the List of Endangered and Threatened Wildlife and Plants (85 FR 81144).

Life History and Habitat

Northern spotted owls are primarily nocturnal (Forsman et al. 1984, pp. 51-52) and spend virtually their entire lives beneath the forest canopy (Courtney et al. 2004, p. 2-5). They are adapted to maneuverability beneath the forest canopy rather than strong, sustained flight (Gutiérrez et al. 1995, p. 9). They forage between dusk and dawn and sleep during the day with peak activity occurring during the two hours after sunset and the two hours prior to sunrise.

Northern spotted owls seek sheltered roosts to avoid inclement weather, summer heat, and predation (Forsman 1975, pp. 105-106; Barrows and Barrows 1978; Barrows 1981; Forsman et al. 1984, pp. 29-30). Northern spotted owls become stressed at temperatures above 28°C, but there is no evidence to indicate they have been directly killed by temperature because of their ability to thermoregulate by seeking out shady roosts in the forest understory on hot days (Barrows and Barrows 1978; Forsman et al. 1984, pp. 29-30, 54; Weathers et al. 2001, pp. 678, 684). During warm weather, northern spotted owls seek roosts in shady recesses of understory trees and will occasionally roost on the ground (Barrows and Barrows 1978, pp. 3, 7-8; Barrows 1981, pp. 302-306, 308; Forsman et al. 1984, pp. 29-30, 54; Gutiérrez et al. 1995, p. 7).

Northern spotted owls are territorial; however, home ranges of adjacent pairs can overlap (Forsman et al. 1984, p. 22; Solis and Gutiérrez 1990, p. 746) suggesting that the core area defended is smaller than the area used for foraging. They will actively defend their nests and young from predators (Forsman 1975, p. 15; Gutiérrez et al. 1995, p. 11). Territorial defense is primarily carried out by hooting, barking and whistle type calls. Some northern spotted owls are not territorial but either remain as residents within the territory of a pair or move among territories (Gutiérrez 1996, p. 4). These birds are referred to as "floaters." Floaters have special significance in northern spotted owl populations because they may buffer the territorial population from decline (Franklin 1992, p. 822). Little is known about floaters other than they exist and typically do not respond to calls as vigorously as territorial birds (Gutiérrez 1996, p. 4).

The northern spotted owl is relatively long-lived, has a long reproductive life span, invests significantly in parental care, and exhibits high adult survivorship relative to other North American owls (Forsman et al. 1984; Gutiérrez et al. 1995, p. 5). They are sexually mature at one year of age, but rarely breed until they are two to five years of age (Miller et al. 1985, p. 93; Franklin 1992, p. 821; Forsman et al. 2002, p. 17). In northwestern California, courtship behavior usually begins in February and females typically lay eggs in late March or April. The timing of nesting and fledging varies with latitude and elevation (Forsman et al. 1984, p. 32). After they leave the nest in late May or June, juveniles depend on their parents until they are able to fly and hunt on their own. Parental care continues after fledging into mid-September (Service 1990, 2003; Forsman et al. 1984, p. 38). During the first few weeks after the young leave the nest, the adults often roost with them during the day. By late summer, the adults are rarely found roosting with their young and usually only visit the juveniles to feed them at night (Forsman et al. 1984, p. 38). Hybridization of northern spotted owls with California spotted owls and barred owls has been confirmed through genetic research (Hamer et al. 1994, pp. 487-492; Gutiérrez et al. 1995, pp. 2-3; Dark et al. 1998, p. 52; Kelly 2001, pp. 33-35; Funk et al. 2008, pp. 161-171).

Northern spotted owls are monogamous and usually form long-term pair bonds. "Divorces" occur but are relatively uncommon. There are no known examples of polygyny in this owl, although associations of three or more birds have been reported (Gutiérrez et al. 1995, p. 10).

Population Status

Rangewide Status of the Species

There is little information regarding the total number of northern spotted owls existing throughout their range. Existing field surveys are not extensive enough, nor consistent enough to produce reliable estimates of the range-wide population size. Since the mid-1990s, range-wide demographic data from 11 long-term monitoring areas has been used as a surrogate to evaluate population trends. Based on the demographic data, the most recent population meta-analysis found:

1. Populations experienced significant annual declines of 6-9 percent on six study areas and annual declines of 2-5 percent on five other study areas,
2. Annual declines translated to a 35 percent reduction in the number of northern spotted owl populations remaining within seven study areas since 1995,
3. Barred owl presence in northern spotted owl territories is the primary factor negatively affecting apparent survival, recruitment, and ultimately, rates of population change,
4. The northern spotted owl will likely decline to extirpation in the northern extent of its range in the next decade where population declines have been greatest (over 60 percent). Additionally, northern spotted owl population simulations indicate that without a reduction in barred owls in northern spotted owl territories and habitat, the populations in Washington and the Oregon Coast Ranges have a greater than 50 percent probability of extirpation (Franklin et al. 2021).

Population estimates were modeled in 2012, utilizing data from 2006. The model simulations found there were an estimated 6,662 northern spotted owls rangewide in 2006. Assuming all females are part of a pair, this projected a steady-state rangewide population size of roughly 3,074 females. If we simplistically assume there were 3,074 females present in the rangewide population in 2006, and that the number of females has declined by 5.3 percent per year since then (based on monitoring in the demographic study areas), we expect there will be 1,358 females in the 2021 rangewide population. More realistically, it is not clear how well the steady-state population estimates approximated the actual population in 2006 and the rangewide rate of population change between 2006 and 2021 has likely been steeper than -5.3, given barred owl and wildfire impacts (Service 2019). Based on adjustments to earlier estimates of the number of sites and females in the population, we hypothesize there are likely 3,000 or fewer individuals present in the rangewide population as of 2021.

Additionally, the actual number of currently occupied locations across the northern spotted owl's range is unknown because many areas remain un-surveyed (Service 2011, p. A-2). Many historical sites are also no longer occupied because northern spotted owls have been displaced by barred owls, timber harvest, or wildfire. However, displaced owls are also known to survive and colonize new territories as they shift in response to wildfire effects. Nonterritorial owls (or floaters) are also still presumed present in the population.

In summary, the rangewide population is in decline as a result of decades of habitat loss and degradation and the recent expansion of barred owl populations throughout the northern spotted owl's range. Given these documented declines, the rangewide populations have a reduced ability to withstand additional impacts from ongoing and future threats.

Threats

The northern spotted owl has declined across large portions of its range since 1990. The immediate threats include habitat loss from timber harvest or severe wildfire and competition with northern barred owls (*Strix varia varia*), which invaded from eastern North America. The most severe declines are occurring in the northern portion of the range, where barred owls have been established for the longest period of time. The current rate of decline raises concerns about the long-term persistence of the northern spotted owl throughout the Pacific Northwest.

Wildfire is the current primary cause of habitat loss on Federal lands. Habitat on private lands has continued to decline since 1990 and has declined at a higher rate than on Federal lands; thus, Federal and State lands are expected to provide the majority of nesting, roosting, and foraging habitat for the foreseeable future. With the exception of some areas in northern California, it is unlikely northern spotted owls will persist in areas without Federal lands.

Five-Year Status Review

In 2004 and 2011, the Service conducted five-year status reviews of northern spotted owl. Refer to the 2011 Recovery Plan for a complete review of the species status.

Population Summary

In the most recent meta-analysis, 26 years of survey and capture-recapture data from long-term demographic study areas (DSAs) across the range were used to analyze demographic traits, rates of population change, and occupancy parameters for northern spotted owl territories. The most recent annual rate of decline (5.3 percent) indicates its extinction risk has significantly increased since the time of listing (Franklin et al. 2021 p. 13). The populations in the DSAs have declined from 32 to over 80 percent since the early- to mid-1990s.

If this rate continues into the future, the northern spotted owl will likely decline to extirpation in the northern portion of its range in the near future where population declines have been greatest – over 60 percent. Additionally, population simulations indicate that without a reduction in barred owls in northern spotted owl territories and habitat, populations in Washington and the Oregon Coast Ranges have a greater than 50 percent probability of extirpation.

Barred owl presence in northern spotted owl territories was the primary factor negatively affecting apparent survival, recruitment, and ultimately, rates of population change. The analysis of northern spotted owl and barred owl detections in an occupancy framework corroborated the capture-recapture analyses with barred owl presence 1) increasing northern spotted owl territorial extinction (where they leave their territories) and 2) decreasing northern spotted owl territorial colonization (where they establish new territories). While landscape habitat components of higher value habitats reduced the effect of barred owls on northern spotted owl rates of decline, they did not reverse the negative trend. The northern spotted owl's populations potentially face extirpation if the negative effects of barred owls are not ameliorated while maintaining northern spotted owl habitat across their range (Franklin et al. 2021).

Critical Habitat

A revised designation of spotted owl critical habitat was published on December 4, 2012 (77 FR 71875) and became effective January 3, 2013. In response to a stipulated settlement agreement, the Service proposed a new revised critical habitat rule in 2020 (85 FR 48487), that included exclusions to the 2012 rule limited to approximately 200,000 acres in Oregon. The final rule (86 FR 4820), published in January 2021, included the withdrawal of almost 3.5 million acres of critical habitat with significant modifications occurring in Washington, Oregon, and California. A final revised rule (86 FR 62606) became effective on December 10, 2021, which only included modifications in Oregon. Critical habitat for the northern spotted owl now includes approximately 9,577,969 acres in 11 units and 60 subunits in California, Oregon, and Washington. The table below lists the units and subunits of critical habitat for northern spotted owl in California.

Critical Habitat Units for Northern Spotted Owl in California	Critical Habitat Subunits for Northern Spotted Owl in California
Unit 3	RDC 1
	RDC 2
	RDC 5
Unit 8	ECS 2
	ECS 3
Unit 9	KLW 4
	KLW 5
	KLW 6
	KLW 7
	KLW 8
	KLW 9
Unit 10	KLE 6
	KLE 7
Unit 11	ICC 1
	ICC 2
	ICC 3
	ICC 4
	ICC 5
	ICC 7
	ICC 8

The final rule for critical habitat defines the primary constituent elements (PCEs) as the specific elements of the physical and biological features (PBFs) that are considered essential to the conservation of the northern spotted owl and are those elements that make areas suitable as nesting, roosting, foraging, and dispersal habitat (Service 2012, p. 71904). In 2016, the Service returned to the use of statutory reference of PBFs rather than PCEs when evaluating and discussing the availability and function of, as well as the effects to the attributes of critical habitat in the adverse modification analysis (Service and NOAA's NMFS 2016, p. 2716). References to PCE here are to be consistent with cited critical habitat rule. The PCEs should be arranged spatially such that it is favorable to the persistence of populations, survival and reproductive success of resident pairs, and survival of dispersing individuals until they are able to recruit into a breeding population (Service 2012, p. 71904). Within areas essential for the conservation and recovery of the northern spotted owl, the Service has determined that the PCEs are:

1. Forest types that may be in early-, mid-, or late-seral stages and that support the northern spotted owl across its geographic range;
2. Habitat that provides for nesting and roosting;
3. Habitat that provides for foraging;
4. Habitat to support the transience and colonization phases of dispersal, which in all cases would optimally be composed of nesting, roosting, or foraging habitat (PCEs 2 or 3), but which may also be composed of other forest types that occur between larger blocks of nesting, roosting, or foraging habitat (Service 2012, pp. 72051-72052).

Some critical habitat subunits may contain all of the PBFs and support multiple life history requirements of the northern spotted owl, while some subunits may contain only those PBFs necessary to support the species' particular use of that habitat. All of the areas designated as critical habitat, however, do contain PCE 1, forest type. As described in the final rule, PCE 1 always occurs in concert with at least one other PCE (PCE 2, 3, or 4; Service 2012, p. 72051). While the designation may overlap, northern spotted owl critical habitat does not typically consist of large meadows, grasslands, oak woodlands, aspen woodlands, or manmade structures and the land upon which they are located (Service 2012, p. 71918).

Recovery Plan

The Revised Recovery Plan was published in June 2011 (Recovery Plan). It identifies competition with barred owls, ongoing loss of habitat from timber harvest, loss or modification of habitat from uncharacteristic wildfire, and loss of amount and distribution of habitat from past activities and disturbances as the primary threats (Service 2011, p. II-2 and Appendix A). To address these threats, the recovery strategy includes: 1) developing a rangewide habitat modeling framework, 2) barred owl management, 3) monitoring and research, 4) adaptive management, and 5) habitat conservation and active forest restoration (Service 2011, p. II-2).

There are 14 recovery actions that specifically address habitat loss and degradation. Two actions of primary importance for Federal land managers are recovery actions 10 and 32:

- Recovery Action 10: "Conserve northern spotted owl sites and high value habitat to provide additional demographic support to the population." This recovery action addresses both nesting/roosting and foraging habitat. Interim guidance consists of a framework to help determine and prioritize high value habitat and northern spotted owl sites for conservation (Service 2011, pp. III-44 to III-45).
- Recovery Action 32: "Because recovery requires well distributed, older and more structurally complex multi-layered conifer forests on Federal and non-Federal lands across its range, land managers should work with the Service…to maintain and restore such habitat while allowing for

other threats, such as fire and insects, to be addressed by restoration management actions. These high-quality northern spotted owl habitat stands are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees." This recovery action primarily addresses nesting/roosting habitat, but forest stands or patches meeting the described conditions are a subset of nesting, roosting and foraging habitat (Service 2011, p. III-67).

Because maintaining or restoring forests with high-quality habitat will provide additional support for reducing key threats faced by northern spotted owls, protecting these forests should provide them with high-quality refugia habitat from negative competitive interactions with barred owls that are likely occurring where the two species' home ranges overlap.

The Recovery Plan strongly encourages land managers design projects to meet the intent of the recovery actions, including strategies that include active forest management. In other words, land managers should not be so conservative that, to avoid risk, they forego actions necessary to conserve forest ecosystems which are necessary to the long-term conservation of the species. But they should also not be so aggressive that they subject northern spotted owls and their habitat to treatments where long-term benefits do not clearly outweigh the short-term risks. Finding the appropriate balance to this dichotomy remains an ongoing challenge for those engaged in northern spotted owl conservation (Service 2011, p. II-12).

Both the Recovery Plan and the 2012 (and 2021) critical habitat designations build on the Northwest Forest Plan and recommend continued implementation of the Plan and its standards and guidelines (Service 2011, p. I-1). This includes being consistent with the management direction for Late-Successional Reserves.

In addition to recovery actions regarding habitat, there are 10 recovery actions specific to addressing barred owl threats. We have undertaken Recovery Action 30; designing and implementing large-scale control experiments to assess the effects of barred owl removal on northern spotted owl site occupancy, reproduction, and survival. We are currently planning Recovery Action 31; manage to reduce the negative effects of barred owls on northern spotted owls, to help meet Recovery Criteria (Service 2011, p. III-65).

Barred Owls

Recovery objectives in the Recovery Plan for dry forests include maintaining sufficient northern spotted owl habitat in the short-term to allow them to persist in the face of threats from barred owl expansion and habitat loss from wildfires. While large wildfires continue to be a leading cause of habitat loss on federal lands, competition from barred owls is considered the primary cause of population decline (Franklin et al. 2021, Dugger et al. 2016, Service 2011). Barred owls have expanded their distribution across the range of the northern spotted owl and are now distributed throughout all of the provinces across the range. All of the National Forests in northern California (Klamath, Mendocino, Modoc, Shasta-Trinity, and Six Rivers), and private industrial timberland managers with large-scale survey efforts have confirmed occupancy and nesting by barred owls (Service 2000-2023 consultation records for various projects).

At this time, barred owls do not appear to be as densely distributed in the California Klamath or California Cascades Provinces (also recovery units) as in the California Coastal Province or the other physiographic provinces and recovery units to the north. They are increasingly detected during northern spotted owl surveys throughout all provinces, however. The available data suggests strong demographic effects to northern spotted owls and negative inter-specific interactions between the two species (Franklin et al. 2021, Courtney et al. 2004, Dugger et al. 2016, 2011, Gutiérrez et al. 2007, Hamer et al. 2007, Livezy and Fleming 2007, Monahan and Hijamans 2007, Van Lanen et al. 2011, Wiens et al. 2014, 2010). There is current evidence that barred owls occur in higher densities than northern spotted owls in many parts of the range (Hamer et al. 2007, Singleton et al. 2010, Wiens et al. 2014, 2011). In a recent study, the highest densities were in the Oregon Coast Range, with up to 20 barred owls reported per northern spotted owl territory (Wiens et al. 2017).

Barred owls and northern spotted owls share similar habitats and likely compete for food resources (Hamer et al. 2001, Gutiérrez et al. 2007, Livezey and Fleming 2007, Wiens et al. 2014). Barred owl diets are more diverse than northern spotted owl diets and include species associated with riparian and other moist habitats (e.g., fish, invertebrates, frogs, and crayfish), along with more terrestrial and diurnal species (Smith et al. 1983, Hamer et al. 2001, Gronau 2005, Wiens et al., 2014). Where the two species overlap, barred owls may be taking the primary prey of northern spotted owls, reducing availability and density of these prey species (woodrats and flying squirrels). This can lead to a depletion of prey such that northern spotted owls cannot find an adequate amount of food to support reproduction or individual survival (Gutiérrez et al. 2007, Livezey and Fleming 2007). These impacts are likely having additional effects on ecosystem processes and food webs of other species (Holm et al. 2017). In addition to competition for prey, barred owls are competing for habitat (Hamer et al. 1989, Dunbar et al. 1991, Herter and Hicks 2000, Pearson and Livezey 2003, Wiens et al. 2014).

Barred owls were initially thought to be more closely associated with early-successional forests than northern spotted owls, based on studies conducted on the west slope of the Cascades in Washington (Hamer et al. 1989, Iverson 1993). More recent studies show they frequently use mature and old-growth forests (Pearson and Livezey 2003, Gremel 2005, Schmidt 2006, Singleton et al. 2010).

In the fire-prone forests of eastern Washington, a telemetry study conducted on barred owls and northern spotted owls showed barred owl home ranges were located on lower slopes or valley bottoms, in closed canopy, mature, Douglas-fir forest, while northern spotted owl sites were located on mid-elevation areas with southern or western exposure, characterized by closed canopy, mature, ponderosa pine or Douglas-fir forest (Singleton et al. 2005). Several other studies in western Washington have also shown that when barred owls are present, northern spotted owl habitat use shifts upslope and into areas with steeper slopes and more marginal habitat conditions (Pearson and Livezey 2003, Gremel et al. 2005, Mangan et al. 2019, Irwin et al. 2020). The most recent rangewide meta-analysis indicates barred owl colonization of northern spotted owl territories is more likely in lower-elevation territories in most of the DSAs (Franklin et al. 2021).

Dugger and others have described synergistic effects associated with northern spotted owl territory composition and presence of barred owls. Some pairs retained their territories and continued to survive and successfully reproduce, even when barred owls were present. The effects of reduced old growth forest in core areas were also compounded when barred owls were present and extinction rates of northern spotted owl territories nearly tripled when barred owls were detected under these conditions (Dugger et al. 2011).

Most recently, apparent survival, recruitment, and territory colonization and extinction rates were the key vital rates associated with barred owl presence in northern spotted owl populations (Franklin et al. 2021). The authors suggest that without barred owl management, near-term extirpation of northern spotted owls likely in portions of the range, and the small populations that may remain in other parts of the range will be highly vulnerable to extirpation from wildfire or other stressors, resulting in eventual extinction.

The meta-analysis of the larger, multi-year barred owl removal experiment (Wiens et al. 2021) in five DSAs across the range also demonstrates the removal of invasive barred owls has a strong, positive effect on survival of native northern spotted owls, and subsequently reduced long-term population declines.

Removal of barred owls also influenced the dispersal dynamics of resident northern spotted owls in at least two study areas where northern spotted owls from territories that did not have barred owl removal showed an increased estimated probability of movement to territories where barred owls had been removed. The results of the barred owl control experiments across the northern spotted owl's range indicate that persistence and recovery of northern spotted owl populations are possible with active control, at least over the short term, in managed areas (Wiens et al. 2021).

The research and literature clearly demonstrate the negative influence barred owls are having on northern spotted owl site occupancy, fecundity, reproduction, apparent survival, and detectability. The data indicates that over the last 26 years, they are significantly contributing to northern spotted owl population declines (Olson et al. 2005, Forsman et al. 2011, Dugger et al. 2011, 2016, Franklin et al. 2021).

As barred owls have expanded, the occupancy of historical and new northern spotted owl territories is declining, and territory extinction is increasing. Where barred owls and northern spotted owls overlap in spatial distribution, habitat use, and prey use, there is a high potential for interference competition (Wiens et al. 2014, Dugger et al. 2011). Spatial avoidance may be one way for northern spotted owls to reduce these competitive interactions; however, this may put them at greater risk for predation and limit the resources available to them. Habitat loss will likely further constrain the two species to the same set of limited resources, thereby increasing competitive pressure and leading to additional negative impacts to northern spotted owls (Wiens et al. 2014). However, recovery will also require short and long-term availability of older forests and suitable habitat on the landscape (Wiens et al. 2021, Franklin et al. 2021).

The current condition for barred owls and northern spotted owls further supports previous recommendations to conserve and preserve high-quality habitat (Forsman et al. 2012, 2011, Dugger et al. 2011, Service 2011, 2012). Northern spotted owls can be displaced because of fire or habitat reductions from forest management. They may have increased difficulty in finding new territories to colonize, or in expanding their home ranges to compensate for habitat reductions when barred owls are present on the landscape. In areas where northern spotted owls and barred owls compete directly for resources, maintaining larger amounts of older forest (nesting/roosting habitat) may help northern spotted owls persist in the short term (Dugger et al. 2011, 2016).

There are current information gaps regarding 1) the ecological interactions between the two species (Service 2011, p. III-62), and 2) the effects of forest management on their interactions (Courtney et al. 2004, Service 2011). These factors are not fully understood or described, and ongoing and future monitoring may provide further understanding.

While the scientific literature has explored the link between climate change and the invasion by barred owls, changing climate alone is unlikely to have caused the invasion (Livezey 2009). In general, climate change can increase the success of introduced or invasive species in colonizing new areas. Invasive animal species are more likely to be generalists, like the barred owl, than specialists, such as the northern spotted owl. Generalists can typically adapt more successfully to a changing climate. Recent forecasts indicate climate change will have long-term and variable impacts on forest habitat at local and regional scales. Locally, this could involve shifts in tree species composition that influence habitat suitability. Frey et al. (2016) concluded that old-growth habitat will provide some buffer from the impacts of regional warming or slow the rate at which some species relying on old-growth habitat must adapt. This finding is based on modeling of the fine-scale spatial distribution, below-canopy air temperatures, in central Oregon's mountainous terrain. Similarly, Lesmeister et al. (2019) concluded that older forest can serve as a buffer to climate change and associated increases in wildfire, as these areas have the highest probability of persisting through fire events even in weather conditions associated with high fire activity.

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Southwestern Willow Flycatcher and its Critical Habitat

Listing Status

The southwestern willow flycatcher (flycatcher) was listed as endangered by the Service on February 27, 1995 (60 FR 10695). The Service completed a final rule designating critical habitat for the flycatcher on January 3, 2013 (78 FR 344).

The Service completed a recovery plan for the flycatcher on August 30, 2002 (Service 2002). The recovery plan established management units within larger recovery units for the flycatcher and set recovery goals for each management unit.

Life History and Habitat

The flycatcher is a small, neotropical migrant bird that grows to about 15 centimeters (5.8 inches) in length (Service 2002, p. 26). It eats a wide range of invertebrate prey including flying, and ground- and vegetation-dwelling, insect species of terrestrial and aquatic origins (Drost et al. 2003, pp. 96–102). The flycatcher spends the winter in locations such as southern Mexico, Central America, and probably South America (Ridgely and Gwynne 1989, p. 303; Stiles and Skutch 1989, pp. 321–322; Howell and Webb 1995, pp. 496– 497; Unitt 1997, pp. 70–73; Koronkiewicz et al. 1998, p. 12; Unitt 1999, p. 14).

Population Status

Once considered to be a widespread common breeder in southern California, the southwestern willow flycatcher had declined precipitously throughout its range within the 50 years prior to listing in 1995 (Unitt 1987; Service 1995). At the time of the listing, the number of southwestern willow flycatcher territories was estimated to be approximately 350 known territories (Service 2002), but this estimate was based on limited survey data and was acknowledged to be an underestimate of the probable population size. Listing of the southwestern willow flycatcher not only improved habitat protections, but it provided incentive to improve the level of effort expended to locate and monitor southwestern willow flycatchers throughout their range.

At the time the recovery plan was completed in 2002 (i.e., including information up through 2001), 986 southwestern willow flycatcher territories were known rangewide, with 256 known territories in California, and 186 known territories in the Coastal California Recovery Unit. Southwestern willow flycatcher territories in the Coastal California Recovery Unit were distributed across relatively small watersheds, mostly in the southern third of this recovery unit (Service 2002); 101 territories were within the San Diego Management unit, encompassing San Diego County and the southern portion of Orange County. Most breeding sites were small (<5 territories); the largest populations within the Coastal California Recovery Unit were along the San Luis Rey (57 territories), Santa Margarita (18 territories), and Santa Ynez (26 territories) Rivers (Kus et al. 2003).

After the completion of the recovery plan in 2002, additional surveys for southwestern willow flycatcher were conducted. In 2007, 1,299 southwestern willow flycatcher territories were estimated rangewide (Durst et al. 2008; Service 2014); this apparent increase from the 2001 population estimate (Service 2002) should not be interpreted as an increase in the actual population because the rangewide survey effort has also continued to increase since the completion of the recovery plan. In contrast, the estimated number of flycatcher territories in California in 2007 was 172, with 120 territories in the Coastal California Recovery Unit and 77 territories in the San Diego Management Unit; once again, these decreased population estimates coincided with a changed (i.e., decreased) level of survey effort within California since 2001. Since 2007 all coastal California populations except the upper San Luis Rey River population have experienced steady declines and support only a few remaining pairs (Kus et al. 2015).

Critical Habitat

Flycatcher critical habitat was initially designated on October 19, 2005, and revised on January 3, 2013 (Service 2005, 2013). The current critical habitat designation encompasses approximately 1,227 stream miles including riparian areas and streams within the 100-year floodplain or flood-prone areas for a total of 208,973 acres of designated critical habitat. Critical habitat is designated in multiple counties in Arizona, California, Nevada, New Mexico, Utah, and Colorado (Service 2013).

The PBFs of flycatcher critical habitat that support feeding, nesting, and sheltering and are essential to the conservation of the southwestern willow flycatcher include:

1. Riparian habitat in a dynamic river or lakeside (natural or manmade) successional environment (for nesting, foraging, migration, dispersal, and shelter) that comprises:

    a. Dense riparian vegetation with thickets of trees and shrubs that can range in height from about 6 to 98 feet;

    b. Areas of dense riparian foliage at least from the ground level up to approximately 13 feet above ground or dense foliage only at the shrub or tree level as a low, dense canopy;

    c. Sites for nesting that contain a dense (about 50 percent to 100 percent) tree or shrub (or both) canopy (the amount of cover provided by tree and shrub branches measured from the ground); and/or

    d. Dense patches of riparian forests that are interspersed with small openings of open water or marsh or areas with shorter and sparser vegetation that creates a variety of habitat that is not uniformly dense.

2. A variety of insect prey populations found within or adjacent to riparian floodplains or moist environments (Service 2013).

Recovery Plan Information

The Recovery Plan for the flycatcher was made available to the public in August 2002. The overall recovery objective for the flycatcher is to attain a population level and an amount, quality, and distribution of habitat sufficient to provide for the long-term persistence of metapopulations, even in the face of local losses (e.g., extirpation). There are two alternative sets of criteria (Criteria Set A and Criteria Set B) to help determine when to reclassify the flycatcher from endangered to threatened (Service 2002, pg. 77-78). Neither set of criteria equates to achieving approximate, historical, pre-European settlement population levels. The sets of criteria can be summarized as follows, with further information available in the 2002 Recovery Plan document:

> Criteria Set A: Increase the total known population to a minimum of 1,950 territories (equating to approximately 3,900 individuals), geographically distributed to allow proper functioning as metapopulations, so that the flycatcher is no longer in danger of extinction. For reclassification to threatened status, these prescribed numbers and distributions must be reached as a minimum and maintained over a five-year period.

> Criteria Set B: Increase the total known population to a minimum of 1,500 territories (equating to approximately 3,000 individuals), geographically distributed among Management Units and Recovery Units so that the flycatcher is no longer in danger of extinction. For reclassification to threatened status, these prescribed numbers and distributions must be reached as a minimum and

maintained over a three-year period, and the habitats supporting these flycatchers must be protected from threats and loss.

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Yuma Ridgway's Rail

Listing Status

The Service listed the Yuma Ridgway's rail as endangered in 1967 (32 FR 4001) under the Endangered Species Preservation Act of 1966, a precursor to the 1973 Act. Since that time, Chesser *et al*. (2014) revised the check-list of North American birds to replace *Rallus longirostris* (clapper rail) with *R. obsoletus* (Ridgway's rail). This revision of the name of the species did not affect the taxon with regard to its listing status as endangered.

Life History and Habitat

The emergent wetlands, or marshes, in the Salton Sea watershed, one of three major core areas, comprise a substantial portion of habitat for the species' range in the southwestern U.S. These wetland habitats are managed by Federal, State, and local resource agencies and are sustained by direct deliveries of water from the Colorado River. As the Salton Sea has receded, several acres of unmanaged marshes have developed that are sustained by water that is discharged from agricultural fields (irrigation drain water), which has drained onto the exposed dry Salton Sea playa. The management of Yuma Ridgway's rail wetland habitat is complicated by increasingly limited availability of freshwater sources and risks posed by potentially harmful concentrations of selenium found in irrigation drain water that can accumulate within the Yuma Ridgway's rail's food sources (Ricca *et al*. 2022).

Yuma Ridgway's rail breeding activity begins in February with nesting beginning in March, peaking in mid-May on the lower Colorado River (Eddleman 1989). The breeding season is protracted with chicks fledging from May to August (Harrity and Conway 2017). Because rails nest in dense marsh vegetation, documentation of reproduction and quantification of reproductive rates is difficult and no data exist to determine whether these rates are increasing, decreasing, or remain constant. Selenium toxicity can affect reproduction and there is some evidence to suggest that high selenium exposure rates adversely affect reproduction in populations occurring along the Colorado River (Rusk 1991), but we lack data to determine if selenium exposure rates within the range of Yuma Ridgway's rail are leading to a decline in reproduction across the range or within populations.

Population Status

Yuma Ridgway's rail was originally restricted to the cattail-bulrush marshes of the Colorado River Delta in Mexico, encompassing 3,000 square miles (1,920,000 acres) of freshwater and brackish wetlands (Warrick 2002). Construction of multiple large dams along the Colorado River in the early and mid-20th century resulted in dewatering of the Delta and the loss of habitat. Currently, the Yuma Ridgway's rail occupies patches of emergent marsh within the Lower Colorado River, Lower Gila River, tributaries to these rivers, areas adjacent to the Salton Sea, and the Cienega de Santa Clara in Mexico (Service 2009). The most recent estimate of potentially suitable Yuma Ridgway's rail habitat on the Lower Colorado River is 9,041 acres with 4,457 acres of that on four National Wildlife Refuges (Havasu, Bill Williams River, Cibola, and Imperial) (Service 2009). In the southern end of the Salton Sea Basin, approximately 2,000 acres occurs within managed marshes (Ricca et al. 2022). The amount of habitat on the Lower Gila River from the Phoenix metropolitan area to the confluence with the Lower Colorado River is unknown, as is the amount of habitat upstream of Lake Mead. However, neither of these sites contains large amounts of habitat (Service 2009).

The Cienega de Santa Clara marshes support most of the global population (Hinojosa-Huerta et al. 2013). However, this marsh complex is threatened by a variety of factors, including a lack of marsh-rejuvenating flood flows along the Colorado River, water diversion, and a large-scale water-recycling/desalinization project proposal in Arizona that would release hypersaline brine into the marsh, replacing brackish irrigation runoff (Service 2006, Service 2009, Hinojosa-Huerta et al. 2008).

Home ranges for Yuma Ridgway's rail vary by season. Home ranges are generally smallest during the early and late breeding seasons (March through July) at 17- 20 acres and largest in the post breeding season (August through October) at 37 acres and late winter (January through February) at 59 acres (Conway et al. 1993).

Recovery Plan Information

A formal recovery plan has not yet been developed by the Service. However, a draft first revision was published in 2009 (Service 2009). To achieve recovery, the Yuma Ridgway's rail must reach and maintain a viable population level (a minimum of 824 individuals in the U.S. for at least 5 consecutive years) and have sufficient protected and managed marsh habitat to provide for long-term persistence of populations in the three major core areas (Lower Colorado River, Salton Sea, and Cienega de Santa Clara) and movement corridors (Service 2009). The focus of the recovery strategy is: (1) providing long-term management and protection for enough core and other habitats to support viable populations of rails, (2) effective monitoring of populations and habitats, (3) identifying and funding research to provide effective conservation and recovery, and (4) application of research results and monitoring through adaptive management to ensure recovery goals are met (Service 2009).

Currently, monitoring of Yuma Ridgway's rail populations indicate that presence or distribution of birds within a defined area has been consistent since 2009, but we cannot quantify whether the U.S. supports 824 individuals since not every individual bird that occupies a survey site will be detected (Conway 2011). Challenges to recovery include protecting and managing enough marsh habitat to provide for long-term persistence of populations.

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Reptiles

Alameda Whipsnake and its Critical Habitat

Listing Status

The Alameda whipsnake, also known as striped racer, was listed as threatened on December 5, 1997 (62 FR 64306). No Distinct Population Segments have been defined. Critical habitat was designed for this species on October 2, 2006 (71 FR 58176).

Life History and Habitat

Alameda whipsnakes are typically associated with small to large patches of chaparral or coastal scrub vegetation, interspersed with other native vegetation types and rock lands (areas containing large percentage of rocks, rocky features, and/or rock-bearing soil types). Alameda whipsnakes were also observed using adjacent vegetation types, including grassland, oak savanna, and oak-bay woodland, up to 150 m (500 ft.) from coastal scrub and chaparral. Alameda whipsnakes use all slope aspects and brush community canopy closures but were found to be concentrated on slopes facing south, southwest, southeast, east, or northeast. Alameda whipsnakes usually had more than one core area, separated by more northerly aspects. Northerly aspects were used on a regular basis to move between core areas. Selection for southerly and easterly aspects is likely related not only to consistently warmer temperatures but is also associated with the availability of morning sun, which promotes emergence earlier in the day and maximizes the activity period for foraging, mate finding, and digestion (USFWS 2011). Chaparral and coastal scrub vegetation serve as the center of home ranges, providing for foraging opportunities and concealment from predators. Core areas have been found to center around patches of coastal scrub or chaparral as small 0.2 hectare (ha) (0.5 acre [ac.]) embedded in a mosaic of other dominant vegetation types (USFWS 2011). Whipsnakes also require rock outcrops or talus. Small rodent burrows are important retreats, and brush piles and deep soil crevices can also serve as important habitat features. These habitat features are essential for normal behaviors such as breeding, reproduction, and foraging, because they provide egg-laying sites, refuge from predators, thermal cover, shelter, winter hibernacula, and increased foraging opportunities. Whipsnake habitat was directly lost to urban growth; fragmentation due to freeway construction and commercial and residential developments also created barriers to species dispersal, further isolating populations and subpopulations (USFWS 2011).

Alameda whipsnakes are ovoviviparous and have been observed in polyandrous partnerships. Courtship and mating occur from late March through mid-June. During this time, males have been found to move throughout their home range, and females have been found to remain at or near their hibernaculum until mating is complete. A female was observed copulating with more than one male during a mating season, but the extent to which females mate with multiple males (polyandry) is unknown. Suspected egg-laying sites were located in patches of grassland, within 3 to 6 m (10 to 20 ft.) of coastal scrub and were also found in areas of low density scattered scrub intermixed with grassland. Rock outcrops or talus, small rodent burrows, brush piles, and deep soil crevices are essential for normal behaviors such as breeding, reproduction, and foraging, because they provide egg-laying sites, refuge from predators, thermal cover, shelter, winter hibernacula, and increased foraging opportunities (USFWS 2011). Sperm is stored by the male over winter, and copulation commences after emergence from winter hibernacula. Females begin yolk deposition in mid-April, and intervals of 47, 50 and 55 days have been recorded between dates of first known mating and first egg laid. The average clutch size was found to be 7.21 (with a range of 6 to 11), with a significant correlation between body size and clutch size. Incubation lasts about 3 months, and young appear in late summer and fall (USFWS 2011). Hatchlings have been observed or captured above ground from August through November. Hatchlings have been observed with prey in their stomachs prior to winter hibernation, indicating parental care. California whipsnakes (*Masticophis lateralis*) reach maturity in 2 to 3 years, with adults growing to nearly 1.5 m (5 ft.). Based on a study of captive California whipsnakes, they may live for 8 years (USFWS 2011).

Alameda whipsnakes are opportunistic and active daytime predators. They prey extensively on western fence lizards (*Sceloporus occidentalis*) and are often used as an example of a feeding specialist (USFWS 2005). When hunting, the Alameda Whipsnake commonly moves with its head held high and occasionally moves it from side to side to peer over grass or rocks for potential prey (USFWS 2005). Prey is apprehended quickly, pinioned under loops of the body, and engulfed without constriction. In addition to western fence lizards, Alameda whipsnakes feed on a variety of secondary prey; frogs (*Pseudacris* sp. and *Lithobates* sp.), skinks (*Scincidae* sp.), alligator lizards (*Elgaria* sp.), snakes, small birds, amphibians, California slender salamanders (*Batrachoseps attenuatus*), small mammals, fish, and insects are also important in the whipsnake's diet (NatureServe 2015; USFWS 2005; USFWS 2011). The Alameda whipsnake is semi-arboreal and can escape into or hunt in shrubs or trees. Adult Alameda whipsnakes have a bimodal seasonal activity pattern, with peaks during the spring mating season and smaller peak during late summer and early fall. They generally retreat to winter hibernaculum in November and emerge in March; however, short periods of aboveground activity such as basking in the immediate vicinity of the hibernaculum may occur during this time. The Alameda whipsnake is an active daytime predator (USFWS 2011). Rock outcrops are an important feature of their habitat, because they provide retreat opportunities for whipsnakes and promote lizard populations (USFWS 2005).

Population Status

Rangewide Status of the Species

The Alameda whipsnake inhabits the inner Coast Ranges in western and central Contra Costa and Alameda counties, California. The historical range was continuous but has been fragmented into five disjunct populations: Tilden–Briones, Oakland–Las Trampas, Hayward–Pleasanton Ridge, Sunol–Cedar Mountain, and Mount Diablo–Black Hills (62 FR 64306).

The range of the Alameda whipsnake and phenotypic-intergrade specimens includes mosaics of chaparral, coastal scrub, and adjacent vegetation types throughout Contra Costa County, most of Alameda County, and small portions of northern Santa Clara and western San Joaquin counties. This range can be subdivided into five populations that correspond to relatively contiguous mosaics of suitable habitat types that are fragmented by urban development, transportation corridors, and a lack of coastal scrub and chaparral vegetation in the Tri-Valley. Alameda whipsnakes have been found to be locally abundant, and are the dominant snake species when habitat quality is high (USFWS 2011).

Population Summary

The current population size, trend levels, and minimum viable population size are undescribed. There are five populations (corresponding to the species' recovery units) within a fragmented regional metapopulation: 1) Tilden–Briones; 2) Oakland–Las Trampas; 3) Hayward–Pleasanton Ridge; 4) Mount Diablo–Black Hills; and 5) Sunol–Cedar Mountain. Two additional recovery units are associated with movement corridors: Caldecott Tunnel Corridor and Niles Canyon/Sunol Corridor (USFWS 2002; USFWS 2011). Population and species-level trends are assumed to be in decline (a short-term decline of 10 to 30 percent), based on the continued habitat loss, alteration, and fragmentation of known extant habitat (NatureServe 2015; USFWS 2011). In the five populations, there are varying degrees of isolation due to natural and human-caused barriers; these result in varied gene flow within populations and little to none between populations. The boundaries of these five populations and two associated dispersal corridors represent the extent of suitable habitat that includes known Alameda whipsnake locations.

Habitat was directly lost to urban growth; fragmentation due to freeway construction and commercial and residential developments also created barriers to species dispersal, further isolating populations and subpopulations (USFWS 2011).

Remaining natural habitat in these areas may provide movement corridors for the Alameda whipsnake, but it is as yet unknown whether whipsnakes are able to use these corridors in a manner that would promote gene flow (USFWS 2002; USFWS 2011). Little population abundance data exists for the Alameda whipsnake. However, Alameda whipsnakes have been found to be locally abundant and the dominant snake species when habitat quality is high. Almost all trapping studies targeting this species have been designed to determine presence or absence for regulatory purposes and assessing impacts to potential habitat. Monitoring is therefore most often habitat based, assuming snake abundance is positively correlated with the amount of coastal scrub or chaparral vegetation and rock lands present. No studies have been performed that have quantified Alameda whipsnake densities relative to habitat quality or quantity (USFWS 2011).

Threats

Threats to this species include:

- Urbanization and habitat destruction are the greatest threats to the Alameda whipsnake throughout much of its range.
- Numerous water storage reservoirs were constructed throughout the range of the Alameda whipsnake (i.e., San Pablo, Briones, Lake Chabot, and Upper San Leandro reservoirs). These reservoirs resulted in the inundation and large-scale losses and fragmentation of Alameda whipsnake habitat.
- Fire suppression indirectly threatens the Alameda whipsnake by allowing plants to establish a closed canopy that tends to create relatively cool conditions that are less suitable to the Alameda whipsnake, which maintains a relatively high active body temperature.
- Fire suppression: It has been determined that the natural fire return interval for the San Francisco East Bay is 10 to 30 years, and that fire suppression has exacerbated the effects of wildfires by allowing a buildup of fuels, creating the conditions for hotter fires that may directly kill Alameda whipsnakes that do not find retreat in burrows or rock crevices.
- The presence of nonnative plant species is a significant concern for the Alameda whipsnake.
- Succession of core Alameda whipsnake habitat is occurring, from coastal scrub and chaparral to other native vegetation types. It is hypothesized this succession is due to the removal of disturbance regimes. This threat is greatest on more mesic sites where fire and grazing have been removed, particularly on sites in the fog belt in the East Bay Hills.
- Because Alameda whipsnakes forage in grasslands between stands of scrub, livestock grazing that significantly reduces or eliminates plant cover in these grasslands could lead to an increased loss of Alameda whipsnakes and their prey to predation.
- Loss and fragmentation of habitat as a result of road and trail construction is a stressor for the Alameda whipsnake. Roads can impede gene flow and dispersal. Networks of roads and trails fragment habitat, reduce patch size, and increase the ratio of edge to interior habitat.
- Global climate change increases the frequency of extreme weather events, such as heat waves, droughts, and storms. Extreme events, in turn, may cause mass mortality of individuals and significantly contribute to determining which species will remain or occur in natural habitats.

Five-Year Status Review

On April 27, 2012, the USFWS conducted a five-year status review of the Alameda whipsnake, which resulted in no change in listing status (77 FR 25112).

Critical Habitat

On October 2, 2006, the U.S. Fish and Wildlife Service designated critical habitat for the Alameda whipsnake (71 FR 58176). Six critical habitat units were designated in Alameda, Contra Costa, Santa Clara, and San Joaquin counties, California.

Seven critical habitat units (1, 2, 3, 4, 5A, 5B, and 6) are designated as critical habitat for the Alameda whipsnake, encompassing approximately 154,834 acres (ac) (62,659 hectares (ha)), as follows:

- Unit 1: Tilden-Briones; Alameda and Contra Costa counties (34,119 ac (13,808 ha)).
- Unit 2: Oakland-Las Trampas; Contra Costa and Alameda counties (24,436 ac (9,889 ha)).
- Unit 3: Hayward-Pleasanton Ridge; Alameda County (25,966 ac (10,508 ha)).
- Unit 4: Mount Diablo-Black Hills; Contra Costa and Alameda counties (23,225 ac (9,399 ha)).
- Unit 5A: Cedar Mountain; Alameda and San Joaquin counties (24,723 ac (10,005 ha)).
- Unit 5B: Alameda Creek Unit; Alameda and Santa Clara counties (18,214 ac (7,371 ha)).
- Unit 6: Caldecott Tunnel; Contra Costa and Alameda counties (4,151 ac (1,680 ha)).

Critical habitat units are designated for Alameda, Contra Costa, San Joaquin, and Santa Clara counties, California. The primary constituent elements (PCEs) of critical habitat for the Alameda whipsnake are the habitat components that provide:

(i) Scrub/shrub communities with a mosaic of open and closed canopy: Scrub/shrub vegetation dominated by low- to medium-stature woody shrubs with a mosaic of open and closed canopy, as characterized by the chamise, chamise-eastwood manzanita, chaparral whitethorn, and interior live oak shrub vegetation series occurring at elevations from sea level to approximately 3,850 feet (1,170 meters). Such scrub/shrub vegetation within these series form a pattern of open and closed canopy used by the Alameda whipsnake for shelter from predators; temperature regulation, because it provides sunny and shady locations; prey-viewing opportunities; and nesting habitat and substrate. These features contribute to support a prey base consisting of western fence lizards and other prey species such as skinks, frogs, snakes, and birds.

(ii) Woodland or annual grassland plant communities contiguous to lands containing PCE 1: Woodland or annual grassland vegetation series comprised of one or more of the following: blue oak, coast live oak, California bay, California buckeye, and California annual grassland vegetation series. This mosaic of vegetation supports a prey base consisting of western fence lizards and other prey species such as skinks, frogs, snakes, and birds, and provides opportunities for: Foraging, by allowing snakes to come in contact with and visualize, track, and capture prey (especially western fence lizards, along with other prey such as skinks, frogs, birds); short and long distance dispersal within, between, or adjacent to areas containing essential features (i.e., PCE 1 or PCE 3); and contact with other Alameda whipsnakes for mating and reproduction.

(iii) Lands containing rock outcrops, talus, and small mammal burrows. These areas are used for retreats (shelter), hibernacula, foraging, and dispersal, and provide additional prey population support functions.

Recovery Plan Information

A final recovery plan has not been issued; however, a draft recovery plan was issued in November 2002 (USFWS 2002).

Reclassification Criteria

No reclassification criteria have been identified.

Delisting Criteria

Delisting criteria included below are from the draft recovery plan.

- Specified recovery areas are secured and protected from incompatible uses (USFWS 2002). a) Protection for 75 to 100 years of 90 percent of "long-term protection" habitat; and b) Permanent protection of 100 percent of focus areas ("protection in perpetuity" habitat, as refined based on spatial analysis and surveys. Areas include population centers, connectivity areas, corridors, and buffer areas).
- Management plans oriented to species conservation (and adaptively updated based on current research) are approved and implemented for recovery areas (USFWS 2002). Management plans that have the survival and recovery of the species as objectives are: a) Approved and implemented on 100 percent of all focus areas; b) Approved and implemented on 30 percent of lands outside of focus areas but within the recovery unit boundaries; c) Approved, and implementation has begun in an additional 20 percent of the recovery units outside the focus areas; and d) Assured of adequate funding for long-term management.
- Monitoring in recovery areas demonstrates stable or improving trends in species populations and successional diversity of natural habitat (USFWS 2002). a) Representative populations or subpopulations representing the genetic variation and geographic extent of the species, as identified by surveys and genetic study, are stable or increasing with evidence of natural recruitment for a period of 1.5 fire cycles (approximately 60 years) that include normal disturbances; and b) Habitat monitoring shows a mosaic of multi-age class stands, and that habitat fragmentation has not appreciably increased (less than 5 percent) in any recovery unit over current (2002) conditions.
- Threats are ameliorated or eliminated, and fire techniques for habitat management are studied and implemented (USFWS 2002).
- Achieve a mosaic of habitats, ideally through reestablishment of natural fire frequency (USFWS 2002).
- Increased public awareness in the four-county area on urban/wildland issues (USFWS 2002).

Recovery Actions

A final recovery plan has not been issued; however, a draft recovery plan was issued in November 2002 and contained draft recovery actions. The 2011 5-Year Review also contains recommended actions. Both the draft recovery actions and the recommended actions are presented below (USFWS 2002, USFWS 2011).

- Form a Recovery Implementation Team that cooperatively implements specific management actions necessary to recover the species (USFWS 2002).
- Conduct public outreach and education; and develop and implement a regional cooperative program (USFWS 2002).
- Conduct mapping, assessment, and analysis exercise (USFWS 2002).
- Protect and conserve the ecosystems upon which the species depends (USFWS 2002).
- Protect and secure existing populations and habitat (USFWS 2002).

- Survey historical locations and other potential habitat where this species may occur (USFWS 2002).
- Conduct necessary biological research and use results to guide recovery/conservation efforts (USFWS 2002).
- Prepare management plans and implement appropriate management in areas inhabited by this special-status species (USFWS 2002).
- Augment, reintroduce, and/or introduce this species (USFWS 2002).
- Develop a tracking process for the completion of recovery tasks and the achievement of delisting criteria (USFWS 2002).
- Refine delisting criteria (USFWS 2002).
- Conduct status reviews of the species to determine whether listing as endangered or threatened is necessary (USFWS 2002).
- Assess the applicability, value, and success of this recovery plan to the recovery of Alameda whipsnake every 5 years until the recovery criteria are achieved (USFWS 2002).
- Promote the eradication of blue gum (Eucalyptus globules), Monterey pine (Pinus radiata), Monterey cypress (*Cupressus macrocarpa*), and French broom (*Genista monspessulana*), and other nonnative invasive species in the San Francisco East Bay (USFWS 2011).
- Focus land protection efforts on undeveloped parcels in the Wildland Urban Interface to reduce urban sprawl into chaparral and coastal scrub vegetation, and to reduce the need for fuel reduction treatments in Alameda whipsnake habitat (USFWS 2011).
- Conduct a genetic study, using nuclear DNA, to determine the genetic basis for the phenotype and to determine whether there is a geographic boundary separating the Central and the Southern California clades, whether individuals from each of these clades coexist, and whether gene exchange between the two clades occurs (USFWS 2011).

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Blunt-nosed Leopard Lizard

Listing Status

The Service listed the blunt-nosed leopard lizard as endangered on March 11, 1967 (Service, 1967) and has not designated critical habitat for the species.

Life History and Habitat

The blunt-nosed leopard lizard is a relatively large lizard that is part of the iguana family. It has a long tail, powerful hind limbs and a short, blunt snout. Blunt-nosed leopard lizards exhibit tremendous variation in color and pattern on their backs. Their background color ranges from yellowish or light gray-brown to dark brown, with their undersides uniformly white to yellow. They have rows of dark spots across their backs, alternating with white, cream-colored or yellow bands. During breeding season, males and females develop reddish-orange patches on their sides. Adult males are slightly larger than females.

Blunt-nosed leopard lizards live in central California. They live in arid, open areas that have patchy or sparse vegetation, that is characterized by low, drought-tolerant shrubs. The lizards are found below 2,600 feet (800 meters) in elevation. Current distribution extends from Merced County in the north to Santa Barbara and Ventura counties in the south.

Females generally lay eggs once a year, with one to six eggs per clutch. Some females may lay more than one clutch per season under favorable environmental conditions. The blunt-nosed leopard lizard may live up to eight or nine years, but few adults are seen across more than two years.

Blunt-nosed leopard lizards are active during the day in the spring, summer and fall months. Adult activity decreases during the hot summer months of July and August, just as the hatchlings emerge from the burrows. At that point, adults generally retreat into their burrows for the winter. Hatchlings stay out until October or November, before going into burrows. Adults can remain below ground for two winters when poor environmental conditions, such as drought, are present. Younger lizards may not have enough fat reserves to stay below ground for more than one season.

Blunt-nosed leopard lizards use both active foraging and a sit-and-wait strategy to feed. When using the sit-and-wait hunting strategy, the lizard waits for prey to wander near them, and then pounces to capture the prey. Insects make up 97 percent of their diet.

Threats to the species include:

- Habitat loss and degradation from urbanization, agriculture expansion, solar power development, and oil and gas exploration
- Habitat modification by non-native plants and grasses
- Vehicle-related mortality from automobile traffic and off-road vehicles
- Above- or below-average precipitation
- Pesticide use
- Climate change

Population Status

The blunt-nosed leopard lizard lives on the San Joaquin Valley floor and surrounding foothills in central California. Historically, it lived in arid lands throughout much of the San Joaquin Valley and adjacent foothills, ranging from Stanislaus County in the north to the Tehachapi Mountains in the south, as well as in the Carrizo Plain and Cuyama Valley. Widespread agricultural development of the San Joaquin Valley has reduced its habitat to 15 percent of its historic range. Today, small populations of the lizard are found on parcels of undeveloped land scattered from Merced County in the north to Santa Barbara and Ventura counties in the south.

Recovery Plan Information

The recovery strategy for the blunt-nosed leopard lizard is described in the Recovery Plan for Upland Species of the San Joaquin Valley, California (Service, 1998). According to the recovery plan, substantial habitat for the blunt-nosed leopard lizard is already in public ownership or a conservation program; however, appropriate habitat management prescriptions for these parcels are mostly unknown, and none manage parcels specifically for this species. The downlisting and delisting criteria for the blunt-nosed leopard lizard include the following (Service, 1998; Service, 2020a):

Downlisting

2. Protection of occupied habitat:
    a. Five or more areas, each of about 5,997 acres (2,428 hectare) or more of contiguous, occupied habitat, including one each on: the valley floor in Merced or Madera counties; valley floor in Tulare or Kern counties; foothills of the Ciervo-Panoche Natural Area, foothills of western Kern County, and the Carrizo Plain Natural Area.
3. A management plan that includes the survival of the blunt-nosed leopard lizard as an objective has been approved and implemented for all protected areas identified as important to the continued survival of the species.
4. Population monitoring in specified recovery areas shows that each protected area has a mean density of one or more lizards per acre (two or more lizards per hectare) through one precipitation cycle.

Delisting:

2. Protection of occupied habitat:
    a. Three additional areas with about 5,997 acres (2,428 hectares) or more of contiguous, occupied habitat: one on the valley floor, one along the western valley edge in Kings or Fresno counties, and one in the upper Cuyama Valley.
3. A management plan that includes the survival of the blunt-nosed leopard lizard as an objective has been approved and implemented for all protected areas identified as important to the continued survival of the species.
4. Population monitoring in specified recovery areas shows that each protected area has a mean density of one or more lizards per acre (two or more lizards per hectare) through one precipitation cycle.

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Coachella Valley Fringe-Toed Lizard

Listing Status

The Coachella Valley fringe-toed lizard was listed as endangered on September 25, 1980, due to loss and degradation of suitable sand habitats from urban development and agricultural activities (45 FR 63812).

Life History and Habitat

The Coachella Valley fringe-toed lizard is restricted to the Coachella Valley and was found historically from near Cabazon at the northwestern extreme of the Coachella Valley to near Thermal at the southeastern extreme. These lizards are restricted to aeolian sand habitats (e.g., sand dunes, ephemeral sand fields, and stabilized shielded sand fields) and have developed morphological and behavioral adaptations to these unique habitats (Service 2010). About 10 percent of these sand habitats remain in the Coachella Valley (Barrows *et al*. 2008). Reproduction occurs in the spring (typically beginning in March), shortly after adults emerge from winter dormancy, and extends through mid-August. Courtship lasts until the end of May (Service 2008). A few weeks after mating, females dig burrows and deposit two to four eggs that hatch between June and early October (Thelander 1994). Sexual maturity is reached after 2 trends years and life expectancy is about 5 years (TNC 1985).

Population Status

In our 5-year review, we identified 59 known occurrences of the lizard that were presumed extant (Service 2010). Of these, 41 were within Conservation Areas designated under the Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP). Since publication of our 5-year review, occurrences within the East Indio Hills Conservation Area are no longer detected. This Conservation Area is located on the eastern extent of the current range of the species. If lizards were indeed extirpated from this Conservation Area, it would indicate a reduction in the distribution of the lizard has occurred since the time of listing (Service 1980) and our 5-year review (Service 2010). The species is currently distributed in seven fragmented populations, which has resulted in a restricted gene flow among these populations (Vandergast *et al.* 2019).

Recovery Plan Information

The approved recovery plan for the Coachella Valley fringe-toed lizard (Service 1985) does not describe recovery (delisting) criteria but does contain recovery objectives that provide an equivalent function. The primary objective of the recovery plan is to secure two or more protected areas with self-sustaining lizard populations. The reserve design of the CVMSHCP is based on this model and there are currently five conservation areas designated that support persistent, but fragmented, populations of this species totaling about 12,998 acres of modeled habitat on non-Federal lands and protection of sand source/transport and hydrological systems (UCR 2020).

Population fragmentation has led to a decline in overall genetic diversity and increasing genetic differentiation among populations over the past 20 years (Vandergast *et al.* 2019). Based on the most recent genetic research, diversity appears to be maintained in some sites, while it has decreased in others, which may be an indication of bottlenecks or sustained small local population sizes and reduced or absent gene flow (Vandergast *et al.* 2019). A key recovery objective for this species is to maintain genetic diversity. However, evidence suggests that fragmentation and increasing drought frequency have altered the genetic cohesiveness of the species, and the genetic diversity maintained in individual fragments is lower than in the total metapopulation (Vandergast *et al.* 2019). This general trend is at odds with the recovery objective intended to maintain genetic diversity.

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Giant Garter Snake

Listing Status

The giant garter snake was listed as threatened under the Endangered Species Act on October 20, 1993 (Service 1993). The loss and subsequent fragmentation of habitat is the primary threat to the species. The most recent 5-year review was published in 2020; the Service did not recommend a change in the status of the species (Service 2020).

Life History and Habitat

Giant garter snakes inhabit marshes, sloughs, ponds, small lakes, low-gradient streams, and other waterways and agricultural wetlands such as irrigation and drainage canals, rice fields, and the adjacent uplands. The following three habitat components have been identified as the most important to the giant garter snake: 1) a fresh-water aquatic component with protective emergent vegetative cover that will allow for foraging; 2) an upland component near the aquatic habitat that can be used for thermoregulation and for summer shelter in burrows; and 3) an upland refugia component that will serve as winter hibernacula (Service 2017). Giant garter snakes appear to be most numerous in rice-growing regions. The diverse habitat elements of rice-lands contribute structure and complexity to this man-made ecosystem. Spring and summer flooding and the fall drying of rice fields coincide closely with the biological needs of the species (Service 1999). In the summer, giant garter snakes are most likely found in aquatic habitats, typically in active rice fields and most often under aquatic vegetation cover (Service 2012). Giant garter snakes are absent from larger rivers and other water bodies that support introduced populations of large, predatory fish, and from wetlands with sand, gravel, or rock substrates (Service 1993). Giant garter snakes need enough water to provide food and cover during the active season from early spring through mid-fall. They also need emergent wetland plants such as cattails (*Typha* sp.) for coverage and foraging, and grassy banks and openings in vegetation for sunning. During the winter, when they are largely inactive, giant garter snakes need small mammal burrows and other crevices above flood elevations for hibernacula (Service 1999; Service 2012).

Population Status

The listing decision identified 13 populations of the giant garter snake. Currently, nine populations are recognized based on watershed boundaries and genetic evidence of restricted historical gene flow between these watersheds (Service 2017). The short-term population-level trend of this species is a decline of 10 to 30 percent. The long-term population-level trend is a decline of 30 to 50 percent (NatureServe 2022; Service 2012). Currently, populations of the giant garter snake are found in the Sacramento Valley and isolated portions of the San Joaquin Valley; however, the species is extirpated from most of the San Joaquin Valley. Extant populations are distributed in portions of rice production zones of Sacramento, Sutter, Butte, Colusa, and Glenn counties, along with the western border of the Yolo Bypass in Yolo County, and along the eastern fringes of the Sacramento-San Joaquin Delta from the Laguna Creek-Elk Grove region of central Sacramento County southward to the Stockton area of San Joaquin County. As of 2017, there are 9 known populations, found at: (1) Butte Basin; (2) Colusa Basin; (3) Sutter Basin; (4) American Basin; (5) Yolo Basin; (6) Cosumnes-Mokelumne Basin; (7) Delta Basin; (8) San Joaquin Basin; and (9) Tulare Basin (Service 2017).

The species is threatened by:

1) Habitat loss, fragmentation and degradation due to urbanization, infrastructure development and agricultural conversion, including changing fields from rice production to orchards;
2) Invasive aquatic plants and removal techniques for those plants, including herbicides or mowing; and

3) The impacts of climate change, including:
   a) flooding, which can displace snakes and bury them under debris or cause drowning when overwintering in burrows, and
   b) drought, due to the species' dependence on permanent wetlands.

Recovery Plan Information

The Recovery Plan for the Giant Garter Snake was published by the Service in September 2017 (Service 2017). The strategy used to recover the giant garter snake is focused on protecting existing, occupied habitat and identifying and protecting areas for habitat restoration, enhancement, or creation including areas that are needed to provide connectivity between populations. The goal of this recovery plan is to reduce threats to and improve the population status of the giant garter snake sufficiently to warrant delisting. To achieve this goal, we have defined the following objectives:

1) Establish and protect self-sustaining populations of the giant garter snake throughout the full ecological, geographical, and genetic range of the species.
2) Restore and conserve healthy Central Valley wetland ecosystems that function to support the giant garter snake and associated species and communities of conservation concern such as Central Valley waterfowl and shorebird populations.
3) Ameliorate or eliminate, to the extent possible, the threats that caused the species to be listed or are otherwise of concern, and any foreseeable future threats.

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Northwestern Pond Turtle

Listing Status

In July 2012, the Service was petitioned to list 53 species of reptiles and amphibians, including the western pond turtle (*Actinemys marmorata*), as threatened or endangered under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531). The Service published a substantial 90-day petition finding on April 10, 2015 (80 FR 19262). After publication of the 90-day finding, the western pond turtle was split into two separate species: the northwestern pond turtle (*Actinemys marmorata*) and southwestern pond turtle (*Actinemys pallida*). The Service published a proposed rule to list both species as threatened, with a Section 4(d) rule, on October 3, 2023 (88 FR 68370), but did not propose designation of critical habitat due to a lack of sufficient data from which to perform an analysis. The proposed rule also served as a warranted 12-month finding for the two species. Both species will be considered by the Service as "proposed threatened" until publication of a final listing rule in the Federal Register.

Life History and Habitat

The northwestern pond turtle is a medium-sized turtle with size varying geographically, with the largest animals occurring in the northern part of the range (Holland 1994). The maximum carapace (shell) length (CL) is 241 millimeters (mm) (Lubcke and Wilson 2007). Adults typically range in size between 160 to 180 mm long and weigh between 500 to 700 grams (g; Bury et al. 2012). The northwestern pond turtle is sexually dimorphic: Females tend to have a smaller head, less angled snout, taller and rounder carapace, flat (rather than concave) plastron (underside of shell), and thinner tail as compared to males (Holland 1994, Rosenberg et al. 2009). Colors and markings vary geographically and by age with most appearing olive to dark brown, or blackish, occasionally without pattern but usually with a network of spots, lines, or dashes of brown or black that often radiate from growth centers of shields (Bury et al. 2012, Stebbins and McGinnis 2018). The plastron is yellowish, blotched with blackish or dark brown, and occasionally unmarked (Stebbins and McGinnis 2018). Coloration of the head and neck vary by sex, geography, and age (Hays et al. 1999). Males usually have a light-yellowish chin and underside of the throat whereas females tend to have dark prints or rosette rings that usually remain throughout their life. Hatchlings are generally a brown-olive color with visible mottling on the head and neck (Hays et al. 1999) that darken with age. Eggs are off-white, elliptical-oval shaped, and range from 32 to 42 mm in length and from 18 to 25 mm in diameter (Bury et al. 2012). When hatchlings emerge from the nest, they weigh 3 to 7 g with a 25 to 31 mm CL (Bury et al. 2012). The shell of hatchlings is soft and pliable, and the tail is nearly as long as the shell (Ashton et al. 1997, Stebbins and McGinnis 2018). NPWT shells harden by age 3 or 4 (Bury et al. 2012).

Northwestern pond turtles are semi-aquatic, having both terrestrial (hereafter "upland") and aquatic life history phases. Eggs are laid in upland habitat, and hatchings, juveniles, and adults use both upland and aquatic habitat. The amount of time spent on land varies by location and aquatic habitat type. Upland environments are required for nesting, overwintering and aestivation (i.e., warm season dormancy), basking, and movement/dispersal. Aquatic environments are required for breeding, feeding, overwintering, sheltering, basking, and movement/dispersal. The northwestern pond turtle can be found in perennial or intermittent water bodies including streams, rivers, irrigation ditches, ponds, lakes, and reservoirs.

Activity Patterns

<u>Basking</u>

Northwestern pond turtles engage in both emergent (i.e., out of the water) and aquatic basking. Basking is essential for thermoregulation and in turn, physiological functions such as metabolism, digestion, reproduction, and growth. Additional benefits of emergent basking include drying of the shell and skin for parasite and algal control.

The amount of time spent basking varies throughout the range depending on water and air temperature. On the Trinity River in northwestern California, northwestern pond turtles spent more time emergent basking in the main fork, which had cooler water temperatures, than in the warmer south fork (Ashton et al. 2011). Similarly, at both an intermittent stream and perennial stream in Sequoia National Park, California, northwestern pond turtles were more likely to be emergent basking as air temperature increased (Ruso et al. 2017). At the University of California, Davis campus, in northern California, northwestern pond turtles were more abundant at basking sites when water temperatures were warm, and the sites were unshaded (Lambert et al. 2013). Basking structures may be especially important below dams with cold water discharge (Ernst and Lovich 2009). During emergent basking, northwestern pond turtles will retreat into the water or may seek shade once it gets too hot or when body core temperature has reached a desirable level (Ernst and Lovich 2009). Aquatic basking is where they lay completely or almost completely submerged in [warmer] shallow water or within a floating mat of vegetation; and are therefore less visible than when emergent basking (Holland 1992).

Overwintering/Aestivation

The northwestern pond turtle overwinters–in a physical state of little to no activity–during the cooler months of the year in either upland or aquatic environment (Holland 1994, Ultsch 2006). In contrast, aestivation is a period of inactivity, usually in response to the hottest time of year or dry conditions, that only occurs in upland habitat (Hays et al. 1999).

The amount of time spent overwintering and/or aestivating varies geographically and within populations and is likely influenced by climate and hydrological conditions. At two sites in California, western pond turtles left intermittent ponds as they dried out and overwintered in upland habitat, returning to the ponds weeks or months after they refilled (Pilliod et al. 2013, Zaragoza et al. 2015). Similarly, western pond turtles inhabiting intermittent streams may respond to late summer drying and winter flooding by moving into upland habitat (Rathbun et al. 2002). However, in perennial streams and rivers, turtles may remain active until fall/winter storms increase flows and reduce water temperatures (Belli 2016). In northern California, beginning in September, northwestern pond turtles spent seven months of the year away from the Trinity River to overwinter in upland habitat, while others moved to nearby lentic bodies of water (i.e., a lake and a slough) as far as 500 m from the river (Reese and Welsh 1997). Movements, in this case, may have been to avoid winter flood events (Reese and Welsh 1997, Rathbun et al. 2002). Moving to upland habitats above the flood line is generally more common for turtles occupying lotic (i.e., actively moving water) habitats. Along the central California coast, northwestern pond turtles that occupied pond habitat overwintered on-site, whereas most turtles from an adjacent stream left with the first heavy rains and overwintered in the upland habitat or moved to the pond (Davis 1998). In response to spring storms, some turtles remained within the stream under banks or within submerged shoreline or riparian vegetation, whereas others left the stream and moved a minimum of 4 m away (Belli 2016). The range of behaviors between populations and individuals suggests that northwestern pond turtles use several overwintering and aestivation strategies (Holland 1994, Ultsch 2006, Zaragoza et al. 2015). At study sites on the Trinity River and in Santa Rosa in northern California, overwintering locations across successive years were very similar, with distances between overwintering sites as short as one meter (Reese 1996). However, radio-tagged western pond turtles that were tracked for two winters on the Carrizo Plain Ecological Reserve, San Luis Obispo County, California did not have overwintering site fidelity (i.e., they did not return to the same sites) (Pilliod et al. 2013).

Movements and Dispersal

Northwestern pond turtles move between aquatic and upland habitats to nest, overwinter, and aestivate. Males generally move farther than females or juveniles (Bury 1972). Home ranges average 1 hectare (2.47 acres) for males, 0.3 hectare for females, and 0.4 hectare for juveniles (Bury 1972). Overwintering behavior is variable, and likely more common in seasonally inundated ponds than permanent water (Pilliod et al. 2013). Holland (1994) found overwintering sites at two streams/rivers that were 15 to 260 m from aquatic habitat. In northern California along the Trinity River, some turtles moved to upland habitat to either overwinter or aestivate while others moved to lentic bodies of water (i.e., standing bodies of water) as far as 500 m from the river (Reese and Welsh 1997). The pattern and frequency of these movements vary with habitat, size of the aquatic system, suitability of upland habitat, season, climate, environmental stress (e.g., drought, high stream flow), sex, and life stage (Hallock et al. 2017). In central California, northwestern pond turtles spent over half of the year in upland habitat, moving 255 to 1,096 m within the upland habitat but never moving farther than 343 m from seasonal ponds. Western pond turtles moved in different directions, used different microhabitats, and left ponds at different times (Pilliod et al. 2013).

Dispersal (generally defined as a onetime movement of a juvenile from its natal area to establish its own home range) of western pond turtles is generally not well understood. Genetic analyses suggest that most dispersing turtles stay within their natal drainage (Spinks and Shaffer 2005), but few accounts of juvenile (or the rarer adult) dispersal exist. Within aquatic habitat, a dispersal distance of 7 kilometers (km) upstream was observed (5 km overland distance) (Holland 1994). Dispersal may also occur via aquatic habitats during flood events (Rosenberg et al. 2009). Along the central California coast, Holland (1994) recorded less than 10 dispersal events between drainages during a 10-year study with over 2,100 captures and recaptures across 21 drainages, suggesting that overland movements are uncommon. In that study, the longest overland distance recorded in an area considered to be under the best circumstances (mild climate and short distances between water features), was a single individual travelling 5 km. Holland (1994), also states that no movements between drainages were detected from three other sites with over 1,100 hundred captures and recaptures over a 7-year period. During an extreme drought, Purcell et al. (2017) documented a 2.6 km straight-line distance movement overland in a radio-tagged turtle, with a minimum total distance of 3.3 km moved before the individual found water.

Diet

The western pond turtle is omnivorous and considered a dietary generalist (Holland 1994), consuming a wide variety of food items, but animal matter appears to constitute a larger portion of the diet than plant material (Bury 1986, Holland 1994). Prey are primarily taken in water but can be captured or scavenged on land. However, food obtained on land must be returned to the water for consumption, as they appear to be unable to swallow food above water (Holland 1994). Stomach content analysis reveals a diet consisting of small aquatic invertebrates, small vertebrates (e.g., fish, tadpoles, and frogs), carrion, and plant material (Bury 1986, Holland 1994). In northern California, contents of 77 stomachs included aquatic insects such as dragonfly larvae, mayflies, stoneflies, caddisflies, midges, beetles, and other insects, including upland prey items (e.g., grasshoppers) (Bury 1986). Bury (1986) found that 44 percent of females consumed plant material compared to 10 percent for males. Juveniles consumed mostly invertebrates (Bury 1986), and hatchlings primarily feed on nekton (i.e., free-swimming aquatic animals) and larvae of small aquatic insects (Holland 1994).

Reproduction

Courtship behaviors have been observed from April through November, with mating observed in May through September (Holland 1992), and based on limited observations, appear to occur underwater (Holland and Bury 1988, Holland 1992, Goodman 1997, Ashton 2007, Bettelheim 2009). For example, in Monterey County, central California, courtship behaviors were observed in mid-April within a 1.5 m-deep pool with copulation documented the following day in shallow water at a depth of approximately 0.1 m (Bettelheim 2009). In southern California, Holland (1988) observed possible courtship behavior in 2 m-deep water in mid-June. In northern California, mating has been observed in "spring" (Reese 1996).

The age and size at which northwestern pond turtles reach sexual maturity is poorly understood and seems to vary by geography and locale (Holland 1994, Rosenberg et al. 2009, Bury et al. 2012). In general, males exhibit external signs of sexual dimorphism around 110 to 120 mm CL (Bury et al. 2012). In coastal central California, the average male reached 120 mm CL in 3.6 years compared to 4.1 years for females and reached 150 mm CL in 8.3 years for males versus 11.1 years for females (Germano and Rathbun 2008). In Washington, males reach sexual maturity in 10 to 12 years (Hays et al. 1999).

Wide variation occurs throughout the ranges of the two species, but in general, most females carrying eggs are over 6 years old (Bury et al. 2012). In Oregon and northern California, females start carrying eggs when they are at least 120 mm CL and typically 8 to 10 years of age. In southern California, the smallest known reproductive female was approximately 111 mm CL and at least 6 to 7 years old, while the smallest reproductive female in Oregon was 131.3 mm CL (Holland 1994). In coastal central California, a female as young as 4 years old and measuring 141 mm CL was documented carrying eggs (Germano and Rathbun 2008). At two sewage treatment facilities in the San Joaquin Valley, California, females were documented carrying eggs at 4.4 years of age with a CL of 155 mm. In these areas, warmer water and high nutrient loads may have increased aquatic invertebrates, providing increased nutrition for faster growth rates (Germano 2010).

Egg laying occurs from May through July, with northern populations laying eggs later in the season than those in the south (Bury et al. 2012). Gravid females leave the water in the late afternoon or early evening and move into upland habitats to excavate a nest (Holland 1994). Females may be out of the water for a few hours to several days with actual nest excavation and egg laying taking from 2 to over 10 hours. Females may make several forays into upland areas prior to actual oviposition and may abandon nest scrapes prior to laying eggs, potentially because of hitting rocks or roots or because of disturbance, which northwestern pond turtles are extremely sensitive to (Holland 1994). Females will moisten the soil around the nest by urinating prior to digging the nest chamber (Holland 1994, Hays et al. 1999).

Females excavate nests in upland habitat 3 to 500 m from aquatic habitat in compact, dry soils (Storer 1930, Holland 1994, Holte 1998), with an average linear distance from water of 51 m (Davidson and Alvarez 2020). Soil conditions and the frequency and degree of disturbance in the upland habitat, likely influence nest distribution (Thomson et al. 2016). Soils need to be loose enough to allow nest excavation, and typically have a high clay or silt component; likely due in part to the proximity to water bodies. Disturbance needs to be infrequent or of sufficiently low intensity that nesting females are not disturbed while digging nests or laying eggs (Ernst and Lovich 2009). Nests are shallow, generally between 9 and 12 centimeters (cm) below the surface (Holland 1994). After the nest is excavated and eggs deposited, females pack the chamber using surrounding material such as mud, dry soil, and vegetation to form a plug that closes off the "neck" of the nest chamber (Holland 1994).

Clutch size varies from 1 to 13 eggs and is positively correlated with body size (Holland 1994, Holte 1998). In a meta-analysis by Bury et al. (2012), mean clutch size ranged from 4.5 to 8.5 eggs. Nesting frequency also varies across the range, based on female age, geographic location, and environmental conditions such as temperature or resource availability (Holte 1998). Most females appear to deposit eggs every other year, but some may oviposit every year (Holland 1992). Double clutches have been documented in southern California (Goodman 1997), coastal Central California (Scott et al. 2008, Germano and Rathbun 2008), Oregon (Riley 2006 in Rosenberg et al. 2009), and Washington (Hays et al. 1999, Schmidt and Tirhi 2015).

Incubation time is 80 to 126 days (Holland 1994), and hatching rates average approximately 70 percent, with complete nest failure being common (Holland 1994). Hatching success is dependent on soil moisture and temperature during incubation: low precipitation and warmer weather during the summer months improved hatching success, whereas cool, wet summers led to reduced hatching success (Holte 1998).

Northwestern pond turtles exhibit temperature-dependent sex determination (TSD) during incubation (Ewert et al. 1994). In California, female hatchlings were more likely when 30 percent of the sex-determining period occurred above 29 degrees Celsius (°C) (84 degrees Fahrenheit (°F)) (Christie and Geist 2017). Lower fluctuations in temperature resulted in development of males, whereas females developed in nests with high and low temperature fluctuations. Temperatures within nests were found to fluctuate daily, varying by more than 20 °C (36 °F) (Geist et al. 2015, Christie and Geist 2017) with higher maximum temperatures reducing egg viability (Christie and Geist 2017).

In southern and central California, some hatchlings may emerge from the nest chamber in late-summer to early-fall, whereas others overwinter in the nest chamber and emerge in spring (Holland 1994). In the northern parts of the range, hatchlings overwinter in the nest (Holland 1994, Reese and Welsh1997). In western Oregon, hatchlings delayed emergence until spring, and typically remained within 2 m of nests for as long as 59 days after initial emergence (Rosenberg and Swift 2013). During migration from their nests to aquatic habitat, hatchlings embedded themselves in soil for up to 22 days at stop-over sites. Hatchlings entered aquatic habitat on average 49 days after initial emergence and traveled an average of 89 m from their nest site. Hatchlings detected in water were always within 1 m of shore and in areas with dense submerged vegetation and woody debris (Rosenberg and Swift 2013).

Western pond turtles can nearly double in size within a year of hatching (Germano and Rathbun 2008, Germano 2010, Bury et al. 2012). Growth rates can vary greatly based on several factors such as geography and environmental conditions (Bury et al. 2012). For example, Holland (1994) found that turtles between 100 to 110 mm in length are generally 4 to 5 years old but may be as young as 3 or as old as 12. In Oregon, northwestern pond turtles were slightly larger than in California, although the Oregon turtles had a slower growth rate, possibly due to cooler temperatures (Germano et al. 2022).

Survivorship and Longevity

Germano (2016) reported that annual mortality rates for young age classes appear to vary greatly, with mortality of juveniles less than 80 mm CL estimated at 26.9 percent and juveniles up to 120 mm CL at 16.2 percent at a site in the San Joaquin desert in northwestern Kern County, California. In contrast, annual mortality rates for juveniles during their first three years was 85 to 90 percent in the Pacific Northwest (Holland 1994).

Holland (1994) suggested western pond turtle annual survivorship is lowest in the smaller size classes and increases as turtles approach their reproductive years at around 120 mm CL. Further, as reproductive turtles age and become larger, average annual survivorship reaches 95 to 97 percent (Holland 1994). The maximum lifespan of western pond turtles is unknown. However, they are known to be long-lived after reaching adulthood, with some living 55 years (Bury et al. 2012). These old individuals are rare in natural populations, but some may successfully reproduce even late in life, based on a radiograph of a 55-year-old female with eggs (Kaufman and Garwood 2022).

Habitat

Northwestern pond turtles require both aquatic and upland habitats that are within proximity and connected to one another. As habitat generalists, northwestern pond turtles occur in a broad range of permanent and ephemeral water bodies including rivers and streams, lakes, ponds, reservoirs, settling ponds, marshes, vernal pools, irrigation ditches, and other wetlands, including within tidal estuaries (Spinks et al. 2003, Ernst and Lovich 2009, Bury et al. 2012, McGinnis 2018).

Despite their ability to use a wide range of aquatic features, suitable aquatic habitats are often rare, due mainly to widespread urbanization and agricultural conversion. Consequently, northwestern pond turtle distribution is fragmented across their range, following the arrangement of suitable aquatic habitat, especially in areas with extensive open, dry terrain between waterways (Bury et al. 2012). Movements between aquatic and upland habitats are typically less than 500 m (Reese and Welsh 1997), thus aquatic and upland habitats must be adjacent. In a study in northern California, radio-tagged males used upland habitat in at least ten months of the year, emphasizing the importance of upland habitat in addition to aquatic habitat (Reese and Welsh Jr 1997).

<u>Aquatic Habitat</u>

Northwestern pond turtles use aquatic habitat for breeding, feeding, overwintering, and sheltering. Suitable aquatic habitat must contain abundant basking sites, underwater shelter sites (e.g., undercut banks, submerged vegetation, mud, rocks, logs), and standing or slow-moving water (Holland 1992, Reese and Welsh 1998, Hays et al. 1999, Ernst and Lovich 2009). Northwestern pond turtles inhabiting lentic aquatic habitat, such as ponds, lakes, and slack water habitats, often overwinter within the aquatic environment, burying themselves within the bottom substrate, such as mud. Various depths of water provide northwestern pond turtles with habitat necessary for overwintering and hatchling growth. Primary habitat for hatchlings and young juveniles is shallow water with dense submerged vegetation and logs, which most likely provides shelter, prey, and thermoregulatory requirements or other functions for survival (Holland 1994, Rosenberg and Swift 2013).

<u>Basking Sites</u>

Emergent basking (i.e., basking above water or on adjacent upland areas) usually takes place on logs, rocks, emergent vegetation, shorelines, and essentially any other substrate located within and adjacent to aquatic habitat (Holland 1994, Hays et al. 1999). The location of emergent basking sites above or adjacent to aquatic habitat allows for quick retreat into the water if there is perceived danger (Storer 1930). At a site in northern California, stream microhabitats containing emergent basking sites had more turtles present than those without available emergent basking sites (Reese and Welsh 1998). Aquatic basking occurs in shallow water, a top layer of vegetation, or in submerged vegetation, such as algal mats. Aquatic basking may be used when emergent basking sites are limited or not present and provide a warmer ambient temperature than the surrounding water (Jennings and Hayes 1994, Reese and Welsh 1998).

<u>Nesting Habitat</u>

Nesting occurs in upland areas that are 3 to 400 m from aquatic habitat (Holland 1994, Holte 1998). Nesting habitat varies greatly across the species range, but typically females excavate nests in compact, dry soils with sparse vegetation that contains short grasses and forbs and little or no tree canopy cover to allow for exposure to direct sunlight (Holland 1994, Holte 1998, Rathbun et al. 2002, Rosenberg et al.

2009, Riensche et al. 2019). Along the central coast of California, all successful and attempted nest sites were excavated in compact, hard soils with sparse vegetative cover that included coastal sage scrub, exotic annual grasslands, and weed patches (Rathbun et al. 2002). At a study site in Oregon, nest sites had low, dense vegetation with heights averaging 4.8 cm (range = 0 to 20 cm) (Holte 1998), while at a southwest Washington study site, nesting site vegetation heights were 24 to 45 cm (Lucas 2007 in Rosenberg et al. 2009). At this site, where forest vegetation provided canopy cover, turtles selected more open canopies (average of 14 percent) for nesting, especially southerly aspects, and soil temperatures at nest sites were found to be warmer compared to random sites (Lucas 2007 in Rosenberg et al. 2009). Nests generally occur on south or west aspects but can occur on northwest and southeast aspects (Holland 1994, Lucas 2007 in Rosenberg et al. 2009). Most nest sites are on low to moderate slopes (25 degrees or less), but nest site slope can vary from 0 to 60 degrees (Holland 1994).

Hatchling Upland Habitat

Little is known about upland habitat requirements for hatchlings after emerging from the nest. In western Oregon, use of upland habitat and movement by hatchlings varied, and hatchlings were generally found buried into soil or detritus where they were hidden from view (Rosenberg and Swift 2013). After departing these areas, individual hatchlings made stops for varying durations in a variety of habitats. Habitat features included small patches of forest floor (embedded approximately 8 cm under detritus), small patches of forest (buried approximately 5 to 8 cm in the detritus or directly under moss in dense shrub cover), and in sparsely vegetated areas (typically embedded in soil and completely covered by moss) (Rosenberg and Swift 2013).

Upland Overwintering/Aestivation Habitat

Upland habitat used for northwestern pond turtles overwintering and aestivation varies greatly across the range, but generally occurs above ordinary high-water lines or beyond the riparian zone; although understanding of specific microsite conditions is limited (Lucas 2007, Rathbun et al. 2002, Oregon Department of Fish and Wildlife 2015). In the Trinity River system in northern California the greatest distance northwestern pond turtles traveled from their aquatic habitat to upland overwintering sites was approximately 500 m (Reese and Welsh 1997) and Holland (1994) found overwintering sites at two streams/rivers that ranged from 15 to 260 m from aquatic habitat. While vegetation communities differ from site to site, open areas were avoided for overwintering, and leaf litter was present at most sites (Reese and Welsh 1997, Davis 1998, Rathbun et al. 2002). In central California, northwestern pond turtles generally overwintered in areas where they would be exposed to direct sunlight during a portion of the day (Rathbun et al. 2002). In multiple studies in California, overwintering northwestern pond turtles were found buried beneath 5 to 10 cm of leaf litter (Reese and Welsh 1997, Rathbun et al. 2002).

Population Status

The historical range of the northwestern pond turtle extends along the Pacific Coast from British Columbia, Canada south to southern California. In Washington the northwestern pond turtle occurs mainly in the vicinity of the Puget Sound and in Oregon the northwestern pond turtle occurs throughout the state west of the Cascade Range. In California the northwestern pond turtle range includes the entire northern two-thirds of the state except in the Sierra Nevada and the central coast. A small portion of the range extends east into Nevada in the Lake Tahoe region (see range maps in Ernst and Lovich 2009 and Stebbins and McGinnis 2018). The congeneric southwestern pond turtle (*Actinemys pallida*) occurs along the central and southern California coast south into Baja, Mexico.

Northwestern pond turtles have been found at sites from brackish estuarine waters at sea level up to 2,048 meters (m) elevation (Ernst and Lovich 2009) but mostly occur below 1,371 m (Stebbins and McGinnis

2018). Populations in the vicinity of Puget Sound, the Columbia Gorge, and the Carson and Truckee Rivers in Nevada are considered to be isolated from other populations (Holland 1994).

Historical accounts from Vancouver Island and mainland British Columbia, Canada in the lower Fraser River watershed may represent transplanted individuals; no reports of the species are known from either region since 1966 (Gregory and Cambell 1984 in Ernst and Lovich 2009), and northwestern pond turtles are considered extirpated from British Columbia, Canada (Ministry of Environment 2012). Single records from southwestern Idaho and Grant County, Oregon (Nussbaum et al. 1983 in Ernst and Lovich 2009) are likely of introduced individuals (Ernst and Lovich 2009), and other isolated populations within the northwestern pond turtles' native range may also represent introductions (Thomson et al. 2016).

Manzo et al. (2021) collated rough estimates of northwestern pond turtle population sizes from available peer-reviewed literature, reports, and unpublished data sets and found that population size averaged 20.7 individuals (range = 1 to 100+ individuals): Sites with the highest population estimates occurred along the Trinity River in Trinity County, California, and in parts of California's Central Valley (Fresno and Kern counties). While there were several populations estimated over 100 individuals in California and one site with over 100 individuals in Nevada, there was only one population estimated to be over 50 individuals in Oregon (Manzo et al. 2021). Two sites with a mean annual capture of less than 1 individual per year were both in [arid] Kern County, California (Manzo et al. 2021).

In Washington, current population estimates are derived from mark/recapture efforts, population models, and the minimum numbers of northwestern pond turtles observed during surveys at all six northwestern pond turtle sites (Hallock et al. 2017, Bergh and Wickhem 2022, Washington Department of Fish and Wildlife 2022). The total minimum estimated population size for northwestern pond turtle in Puget Sound and the Columbia Gorge was approximately 481 and 281, respectively (although this total involves summing population sizes across years).

Recovery Plan Information

No recovery plan exists for the northwestern pond turtle. However, the Service identified the following threats to the northwestern pond turtle in the species status assessment (Service 2023): (1) habitat loss and fragmentation; primarily from urbanization and agricultural conversion, (2) disturbance via recreational activities such as fishing, boating, and off-highway vehicle use, (3) alteration of natural hydrology through dam building, water diversions, stream channelization, etc., (4) predation by native and nonnative species (e.g., bullfrogs, largemouth bass), (5) competition with nonnative turtle species such as the red-eared slider (*Trachemys scripta elegans*), (6) roadkill mortality, (7) diseases including respiratory disease and shell disease, (8) commercial and private collection as pets and food, (9) toxicants such as pesticides, herbicides, and heavy metals, and (10) climate change impacts including increasing temperatures, drought, extreme flood events, and high severity wildfire.

The conservation needs for northwestern pond turtle includes conserving large blocks of suitable aquatic and associated upland habitat and maintaining connectivity by providing suitable habitat linkages for dispersal. Management activities that address threats to this species include controlling nonnative plants such as *Arundo donax*, controlling non-native aquatic predators and competitors such as fish, bullfrogs, crayfish, and red-eared sliders, and limiting predation by urban predators, such as dogs, ravens, and mammalian mesopredators such as coyote and raccoon (Service 2023, pp. 48, 50-51, 61).

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San Francisco Garter Snake

Listing Status

The San Francisco garter snake was listed as endangered on March 11, 1967 (32 FR 4001). No critical habitat has been designated for the San Francisco garter snake.

Life History and Habitat

San Francisco garter snakes are habitat specialists with several strict habitat requirements. Necessary habitat for San Francisco garter snakes includes densely vegetated standing freshwater habitats with some open water areas, open grassy uplands and shallow marshlands for breeding, and rodent burrows for hibernacula (shelters where they spend dormant winter months) and refugia (USFWS 2006). San Francisco garter snakes occur in the vicinity of standing water—chiefly ponds, lakes, marshes, and sloughs (USFWS 1985). However, temporary ponds and other seasonal water bodies are also used. Emergent and bankside vegetation such as cattails (*Typha* sp.), bulrushes (*Scirpus* sp.), spike rushes (*Juncus* sp.), and water plantain (*Alisma* sp.) apparently are preferred and used for cover (USFWS 1985; USFWS 2006). The interface between stream and pond habitats is used for basking, while nearby dense vegetation or water often provides escape cover. If floating algal mats or rush mats are available, snakes will use these, because they are apparently more secure basking sites (USFWS 1985). Shallow water near shore is essential from May to July to ensure the successful hatching and metamorphosis of amphibian prey items, particularly Pacific tree frogs and California red-legged frogs (USFWS 2006). San Francisco garter snakes also require open grassy uplands and shallow marshlands with adequate emergent vegetation for breeding (USFWS 2006). Flora composition in the upland habitat sites includes, but is not limited to, coyote bush (*Bacharis pillularis*), wild oat (*Avena fatua*), wild barley (*Hordeum* sp.), and various brome species (*Bromus* sp.). San Francisco garter snakes may prefer an "early successional" grassland/shrub matrix with brush densities ranging from one average-sized bush per 30 m^2 (323 sq. ft.) to one large bush per 20 m^2 (215 sq. ft.). By maintaining these ratios, there is sufficient cover from predators, while allowing for exposed surfaces to facilitate thermoregulation. The San Francisco garter snake also depends on ground-burrowing rodents to create burrows for snakes to use as hibernacula and refugia during the winter (USFWS 2006). The connectivity between aquatic and upland habitat is important and is currently threatened by development and infrastructure, including roads and highways (USFWS 2006).

San Francisco garter snakes mate in the spring or fall, and mating is concentrated in the first few warm days of March. Males actively search for females, which are presumably found by scent. Many males may simultaneously court a single female. The augmented frequency in spring mating is thought to be due to the increased likelihood of encountering a mate as individuals emerge from hibernacula and concentrate near aquatic hunting grounds. Mating occurs on open grassy slopes, typically in the morning. Ovulation generally occurs in late spring, pregnancy in early summer, and live birth of young sometime in July or August. Like many members of the genus *Thamnophis*, females can store sperm throughout the winter. Mating aggregations of San Francisco garter snake have been observed in late October and early November (USFWS 1985). Females are ovoviviparous (internal fertilization and young are born live, but no placental connection) and typically bear young in secluded areas, either hidden in dense vegetation or under some type of cover (Stanford University 2013). Litter sizes range from 3 to 85 young and average between 12 to 24 young (USFWS 1985), which are 12.5 to 20 cm (5 to 8 in.) in length at birth (Stanford University 2013). The lifespan of San Francisco garter snakes is unknown, but likely does not exceed 10 years (Stanford University 2013). The sex ratio of San Francisco garter snakes is also unknown, but in other garter snakes (*T. sirtalis*) subspecies, males outnumber females (USFWS 2006). Shallow water near shore is essential from May to July to ensure the successful hatching and metamorphosis of amphibian prey items, particularly Pacific tree frogs and

California red- legged frogs (USFWS 2006). San Francisco garter snakes may depend on ground-burrowing rodents to create burrows, which snakes occupy during winter months (USFWS 2006).

San Francisco garter snakes are opportunistic carnivores that primarily feed on ranid frogs, including Pacific tree frogs (*Pseudacris regilla*) and California red-legged frogs (*Rana draytonii*) (USFWS 2006). Immature California newts (*Taricha torosa*), recently metamorphosed western toads (*Anaxyrus boreas*), bullfrogs, (*Rana catesbeiana*), threespine stickleback (*Gasterosteus aculeatus*), and mosquitofish (*Gambusia affinis*) have also been recorded in the diets of San Francisco garter snakes (USFWS 1985). Individuals on the Stanford University property have been documented to feed on invertebrates and possibly small rodents and birds in addition to amphibians and fish (Stanford University 2013). During the spring and early summer, feeding occurs near or in ephemeral ponds inhabited by Pacific tree frogs, the primary food source for San Francisco garter snakes during this time. Although juvenile San Francisco garter snakes may initially capture and consume Pacific tree frog metamorphs (tadpoles that have recently gained adult frog features) in upland habitat, they have principally been observed moving back to aquatic sites to feed on the young-of-year frogs once these wetter areas begin to dry up and the tree frogs begin to disperse. Mature individuals prey on Pacific tree frogs as well, although they also eat California red-legged frogs during the late summer months. The late emergence of California red-legged frogs allows for a necessary second cycle of feeding by adult San Francisco garter snakes after the Pacific tree frogs have retreated from the drying wetlands to upland aestivation areas (USFWS 2006). Young are born ranging from 13 to 20 cm (5 to 8 in.) in length, and adults can reach a maximum of 130 cm (51 in.) (Stanford University 2013). Prey items are usually captured in wetlands, either in emergent vegetation or in areas of shallow open water (Stanford University 2013; USFWS 2006). Bullfrogs, largemouth bass, and sunfish compete with San Francisco garter snakes for California red-legged frog and Pacific tree frog tadpoles (USFWS 2006).

San Francisco garter snakes are nonmigratory but move between pond foraging habitats and upland wintering sites seasonally. Peak activity occurs between March and July, which may correspond with dispersal patterns of their prey. Radio tracking studies indicate that most individuals remain within 100 to 200 m (328 to 656 ft.) of pond foraging habitats and wintering upland sites. San Francisco garter snakes do not appear to move distances greater than 1 km (0.6 mi.), but they may disperse to new areas in pursuit of prey. Roads and highways may adversely affect dispersal and movement of the San Francisco garter snakes (USFWS 2006).

Population Status

Rangewide Status of the Species

The San Francisco garter snake is endemic to the San Francisco Peninsula and is known only from San Mateo County, California. Historically, San Francisco garter snakes were found on the San Francisco Peninsula from approximately the San Francisco County line, south along the eastern and western bases of the Santa Cruz Mountains at least to the Upper Crystal Springs Reservoir, and along the coast south to Año Nuevo Point, San Mateo County, California (USFWS 1985; USFWS 2006).

Current range is assumed to be equivalent to historic range. Recent surveys suggest that there has likely been very little decrease in the overall range of the San Francisco garter snake compared to its historic distribution; however, they have likely been extirpated from individual localities within what is considered to be the historic range/distribution (USFWS 2006).

Population Summary

There are six known populations of San Francisco garter snake: West of Bayshore, Laguna Salada, San Francisco State Fish and Game Refuge, Pescadero Marsh, Año Nuevo State Reserve, and Cascade Ranch. Little data exist regarding population trends, demographic features, and demographic trends for San Francisco garter snake. In the absence of reliable data regarding trends in the number of individuals in any given population, trends have been inferred from changes in habitat quality and quantity (USFWS 2006). Three of the six known populations appear to be declining, one is likely stable or increasing, and two are unknown (USFWS 2006).

The West of Bayshore population, near the San Francisco International Airport, appears to have declined between 1983 and the mid-1990s, possibly due to drought (USFWS 2006). The Laguna Salada population is declining due to saltwater intrusion, and the Pescadero Marsh population is likely declining due to saltwater intrusion (USFWS 2006). The population statuses are unknown for the San Francisco Fish and Game Refuge and Cascade Ranch populations (USFWS 2006). The population at Año Nuevo State Reserve is likely stable or increasing (USFWS 2006). Overall, the species has experienced a short-term decline of 10 to 30 percent (NatureServe 2015).

In 2020, a Status of the Species report provides an analysis of the current and future condition of 12 population complexes throughout the current range of the species, and also describes a 13th population complex that was formerly considered the most abundant population but is now considered to be extirpated (USFWS 2020).

Threats

Habitat loss and degradation of remaining habitat are the primary threats to the recovery of San Francisco garter snake. The degradation of habitat is primarily due to fragmentation resulting from expansion of infrastructure to support increasing residential and commercial developments, including new roads, improved utilities matrices, and recreational facilities. Secondarily, habitat is degraded by management practices conflicting with the needs of the San Francisco garter snake, including the allowance of serial succession, the increased use of perch ponds (shallow artificial water impoundments often used in San Mateo for irrigation) with decreasing use of stock ponds, the dredging of waterways, and recreational use of off-highway vehicles. Finally, fluctuations in water levels at reservoirs, flood control and channelization, and saline inundation events can result in further habitat degradation (USFWS 2006).

The amount of illegal collection of the San Francisco garter snake and its effects on the species is not clear. The San Francisco garter snake has been illegally collected by amateur herpetologists, and some amount of illegal collection likely still occurs. It is unclear what the impact of unauthorized take is on wild San Francisco garter snake populations, or what can be done to reduce this impact (USFWS 2006).

The epidemic of chytrid fungus (*Batrachochytrium dendrobatidis*), a potentially deadly parasite, poses a threat to most of the San Francisco garter snake's natural prey base. Outbreaks of chytrid fungus are increasing in size and severity throughout the world, perhaps due to recent climate changes that have resulted from abnormal weather patterns. Because of the rapid pace at which chytrid fungus can spread, a lethal outbreak on the Peninsula could be capable of extirpating entire cohorts of amphibians. In the absence of an adequate food source, such an event could lead to catastrophic declines in all garter snake populations range-wide (USFWS 2006).

Probable San Francisco garter snake predators include bullfrog (*Rana catesbeieana*), American crow (*Corvus brachyrhynchos*), red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), black crowned night heron (*Nycticorax nycticorax*), northern harrier (*Circus cyaneus*), great blue heron (*Ardea herodias*), long tailed weasels (*Mustela* *frenata*), and largemouth bass. In all cases, the extent that these predators influence San Francisco garter snake populations is not known (USFWS 2006).

Introduced high densities of mosquitofish have been observed attacking California red-legged frog tadpoles. The stress produced from these attacks was shown to slow develop of the tadpoles, limiting the viability of individuals. With a reduction in the population of California red-legged frogs at a location with mosquitofish, San Francisco garter snakes could experience a similar decline in numbers (USFWS 2006).

Parasites may have been responsible for several mortalities of juvenile San Francisco garter snakes captured at the West of Bayshore location. Parasitic species encountered include a tapeworm, several flagellate protists, and eight different occurrences of nematode worms. Mosquitofish throughout the northern San Francisco Bay Area may serve as hosts for parasitic tapeworms and thorny-headed worms. These parasites could possibly be transmitted to animals that prey on mosquitofish, which include various ranid species and potentially San Francisco garter snakes (USFWS 2006).

One of the greatest threats to the San Francisco garter snake is the reduction of habitat quality resulting from the elimination of disturbance events throughout the Peninsula. Primarily, this is based on changes in management that encourage seral ecosystems. Dynamic grass-dominated uplands provide for, and are potentially maintained by, burrowing rodents that create tunnel systems used by San Francisco garter snakes for hibernacula during the winter months. The loss in recent years of ecological disturbance throughout the majority of San Mateo County has made it possibly for brush species to dominate former grasslands, potentially precluding burrowing animals. Fire suppression has allowed for the domination of these woody species across the coastal landscape, limiting the extent of grasslands that were likely important movement corridors between aquatic habitats. Augmented production levels of cattails also contribute to the loss of open water in aquatic systems. Additionally, the loss of traditional grazing practices on public lands has allowed for the accumulation of dense brush-dominated canopies across the remaining grasslands, which may decrease habitat suitability for the San Francisco garter snake. Reintroducing domestic grazing to grasslands could improve and restore habitat conditions for the San Francisco garter snakes (USFWS 2006). The perpetuation of seral conditions also has negatively impacted suitable aquatic habitat. Cattails (*Typha* sp.) and other emergent aquatic vegetation species may increase siltation rates in freshwater marshes due to the high water demands of these species, as well as their ability to trap overland runoff. The augmented production level of cattails contributes to the loss of the open-water component in aquatic systems. Open water, combined with emergent vegetation, creates a matrix of habitat elements thought to be necessary for Pacific tree frog and California red-legged frog populations—which are crucial for San Francisco garter snake aquatic habitat—already threated by salinization events and the presence of bullfrogs (USFWS 2006).

Increased presence of invasive species can compete for resources with the San Francisco garter snake or hunt individual San Francisco garter snakes directly. Bullfrogs, largemouth bass (*Micropterus salmoides*), and sunfish (Centrarchidae) consume California red-legged frog and Pacific tree frog tadpoles, and bullfrogs may prey directly on San Francisco garter snakes (USFWS 2006).

Steep banks and earthen dams associated with artificial water impoundment reduce the suitability of an area for San Francisco garter snakes. High grade slopes may reduce basking opportunities because of the absence of level areas in close proximity to dense vegetation. Reservoirs are often absent of adequate vegetation, exposing both the snake and its prey to additional predators (USFWS 2006).

Roads and highways may adversely affect dispersal and movement of San Francisco garter snakes. Reptiles often use roads for thermoregulation, which can lead to mortality due to vehicular strikes. Highways may also adversely affect dispersal and movement of amphibian prey species (USFWS 2006).

Five-Year Status Review

There have been two five-year status reviews for this species: one on October 2, 2006, and a more recent one on May 21, 2020. The latest five-year status review conducted a comparison of current condition of the San Francisco garter snake to the recovery criteria for the species. There is only one population with over 200 individuals, and populations with the smallest abundance estimates may have shifted sex ratios (USFWS 2020). Thus, the downlisting criteria for this species are not met (USFWS 2020). The review concluded that the San Francisco garter snake would remain an endangered species (USFWS 2020).

Recovery Plan Information

On September 11, 1985, a Recovery Plan was issued for the San Francisco garter snake (USFWS 1985).

Reclassification Criteria

A primary objective of the 1985 Recovery Plan is to protect and maintain a minimum of six San Francisco garter snake populations, each containing 200 adult snakes (1:1 sex ratio). If this goal is obtained and maintained for 5 consecutive years for six of the ten populations, consideration for threatened status would be appropriate. The six significant populations include the West of Bayshore property (San Francisco International Airport), San Francisco State Fish and Game Refuge property (San Francisco Public Utilities Commission), Laguna Salada/Mori Point property (City of San Francisco/National Park Service), Pescadero Marsh and Año Nuevo State Reserve properties (California State Parks), and Cascade Ranch property (private landowner) (USFWS 1985; USFWS 2006).

Delisting Criteria

Protect and maintain a minimum of ten San Francisco garter snake populations with approximately 200 adults (1:1 sex ratio) at each site within the snake's historic range for 15 consecutive years; delisting can then be considered. The recovery criteria include the six significant populations and the creation of four populations at undefined sites (USFWS 1985; USFWS 2006).

The recovery plan proposed that conservation agreements be signed with each of the landowners controlling the lands containing the six significant populations identified in the plan. However, no agreements have been completed to date and the additional four populations proposed in the recovery plan have not been identified. Additionally, although the precise population ratios of San Francisco garter snakes are unknown, studies of the eastern garter snake (*Thamnophis sirtalis sirtalis*) and the red-sided garter snake (*T.s. infernalis*) indicate that those sub-species do not exhibit 1:1 sex ratios, with males outnumbering females in the wild. If the sex ratios of San Francisco garter snakes are similar to the eastern and red-sided garter snakes, then a sex ratio of 1:1 may not be the appropriate criterion (USFWS 2006). In response to the issues described above, an updated recovery outline was prepared by the U.S. Fish and Wildlife Service (USFWS) in July 1995. In 2004, the Sacramento Fish and Wildlife Office established a San Francisco garter snake working group comprising USFWS employees familiar with current issues facing the species. The group's purpose is to design and implement specific conservation actions that could be performed prior to, and concurrent with, updating the recovery plan. The group is preparing an interim recovery implementation document consistent with the 1995 recovery outline to assist in guiding recovery actions until a revised recovery plan can be developed (USFWS 2006).

Recovery Actions

- Use legal authorities to protect San Francisco garter snake and its habitat by enforcing laws and regulations to promote the conservation of the San Francisco garter snake and its habitat, evaluating success of law enforcement, and proposing appropriate new regulations or revisions (USFWS 1985).

- Protect the six known San Francisco garter snake colonies through appropriate management. These colonies include Pescadero Marsh Natural Preserve, Año Nuevo State Reserve, San Francisco State Fish and Game Refuge, the San Francisco Airport Millbrae site, and at least four additional populations (USFWS 1985).
- Assess population trends and make modifications in management plans if necessary. This includes developing population estimation techniques and conducting population surveys as necessary at Pescadero Marsh Natural Preserve, Año Nuevo State Reserve, San Francisco State Fish and Game Refuge, the Millbrae/Airport site, the Laguna Salada site, Cascade Ranch, and any additional sites discovered (USFWS 1985).
- Identify additional recovery needs for the San Francisco garter snake and modify prime objective/management plans accordingly. This includes obtaining life history data necessary to manage and eventually delist the San Francisco garter snake, determining habitat relationships, reevaluating introgression between the red-sided garter snake and the San Francisco garter snake, and identifying essential habitat (USFWS 1985).
- Provide for public information and awareness by providing onsite interpretive programs on public lands, preparing a small brochure on the San Francisco garter snake and the recovery program, and developing a slide-tape program for public presentations (USFWS 1985).
- Develop an updated recovery plan and an expanded San Francisco garter snake working group (USFWS 2006).
- Encourage conservation among private landowners (USFWS 2006).
- Continue ongoing habitat restoration and enhancement for wild populations (USFWS 2006).
- Complete captive holding facilities for use in head starting programs, in the restoration of worldwide zoo populations, and as temporary lodging during habitat maintenance (USFWS 2006).
- Increase research of population trends, demography, and phylogenetics (USFWS 2006).
- Increase law enforcement at vulnerable locations (USFWS 2006).

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Southwestern Pond Turtle

Listing Status

The southwestern pond turtle is not listed under the Act; however, it is currently proposed threatened and under federal review for listing under the Act (88 FR 68370).

The Service was petitioned to list 53 species of reptiles and amphibians, including the western pond turtle (*Actinemys marmorata*), as threatened or endangered under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531–1543), in July 2012. On April 10, 2015, we published a 90-day finding that the petition presented substantial scientific or commercial information indicating that listing may be warranted for the western pond turtle (80 FR 19262–19263). Since then, the western pond turtle was split into two separate species, the northwestern pond turtle (*Actinemys marmorata*) and southwestern pond turtle (*Actinemys pallida*). The species status assessment was issued in April 2023 (Service 2023), compiling biological information and condition on both species.

Life History and Habitat

The southwestern pond turtle is a medium-sized turtle, with adults ranging from 4.3 to 7.1 inches long (maximum carapace (shell) length) (Germano and Riedle 2015, p. 104). Females tend to have a smaller head, less angled snout, taller and rounder carapace, flat (rather than concave) plastron (underside of shell), and thinner tail as compared to males (Holland 1994, pp. 2-4; Rosenberg et al. 2009, p. 10). Colors and markings vary geographically and by age with most appearing olive to dark brown, or blackish, occasionally without pattern but usually with a network of spots, lines, or dashes of brown or black that often radiate from growth centers of shields (Bury et al. 2012, p. 4; Stebbins and McGinnis 2018, pp. 204–205). Hatchlings are generally a brown-olive color with visible mottling on the head and neck (Hays et al. 1999, p. 2) that darken with age. Hatchlings are 0.98 to 1.22 inches long carapace length (CL) (approximately the size of an American quarter) (Bury et al. 2012, pp. 4, 17). The shell of hatchlings is soft and pliable, and the tail is nearly as long as the shell (Ashton et al. 1997, p. 3; Stebbins and McGinnis 2018, p. 205). The shell becomes fairly hard around three to four years of age (Bury et al. 2012, p. 4). Eggs are off-white, elliptical-oval shaped, and range from 1.26 to 1.65 inches long and from 0.71 to 0.98 inch in diameter (Bury et al. 2012, p. 15).

Seeliger (1945, entire) first proposed geographic differentiation of western pond turtles into northern and southern subspecies based on differences in coloration and the presence and shape of the inguinal scute, the plate where the carapace joins the plastron at the groin. Since then, the western pond turtle was split into two separate species, the northwestern pond turtle (*Actinemys marmorata*) and southwestern pond turtle (*Actinemys pallida*). Recent genetic results corroborate the morphologic distinctiveness (presence/absence of inguinal scutes) as one of the components differentiating northwestern and southwestern pond turtles (Shaffer and Scott 2022, p. 9).

Southwestern pond turtles are semi-aquatic, having both terrestrial and aquatic life history phases. Eggs are laid in upland terrestrial habitat, and hatchings, juveniles, and adults use both terrestrial and aquatic habitat. Terrestrial environments are required for nesting, overwintering and aestivation (warm season dormancy), basking, and movement/dispersal. Aquatic environments are required for breeding, feeding, overwintering and sheltering, basking, and movement/dispersal. Perennial (i.e., year-round) and intermittent (i.e., not year-round) bodies of water occur throughout the range. Some are flowing/lotic (e.g., streams, rivers, irrigation ditches), while others are not flowing/lentic (e.g., ponds, lakes, and reservoirs).

Preferred aquatic conditions are those with abundant basking sites, underwater shelter sites (undercut banks, submerged vegetation, mud, rocks, and logs), and standing or slow-moving water (Holland 1991, pp. 13–14; Reese and Welsh Jr. 1998a, p. 852; Hays et al. 1999, p. 10; Bury and Germano 2008, p. 001.4; Ernst and Lovich 2009, p. 175). Western pond turtles inhabiting lentic aquatic habitat, such as ponds, lakes, and slack water habitats, often overwinter within the aquatic environment, burying themselves within the bottom substrate, such as mud. Various depths of water provide western pond turtles with habitat necessary for overwintering and hatchling growth. Primary habitat for hatchlings and young juveniles is shallow water with dense submerged vegetation and logs, which most likely provides shelter, prey, and thermoregulatory requirements or other functions for survival (Holland 1994, pp. 1-14, 2-12; Rosenberg and Swift 2013, p. 119). Western pond turtles are extremely wary and will rapidly flee from basking sites into the water when disturbed by the sight or sound of people at distances of greater than 328 feet (Bury and Germano 2008, p. 001.5).

Nesting habitat is in close proximity to aquatic habitat and is typically characterized as having sparse vegetation with short grasses and forbs and little or no canopy cover to allow for exposure to direct sunlight (Holland 1994, p. 2-10; Rathbun et al. 2002, p. 232; Rosenberg et al. 2009, pp. 16–17; Riensche et al. 2019, p. 97). Females excavate nests in compact, dry soils that are 9.84 to 1,312 feet from water (Holland 1994, p. 2-10; Holte 1998, p. 54). Additional features of nesting habitat/sites that may be important include aspect, slope, and vegetation.

Overwintering is a state of little to no activity (e.g., brumation) that occurs during the cooler months of the year and can occur in either upland or aquatic environment (Holland 1994, p. 2-7; Ultsch 2006, pp. 341, 356). Southwestern pond turtles also use upland habitat for migration (intra-population (within local populations) movements occurring between aquatic and upland environments), dispersal (movement between populations/watersheds), and aestivation. Aestivation is a period of inactivity, usually in response to the hottest time of year or dry conditions (Hays et al. 1999, p. 7) that occurs in terrestrial habitat.

The western pond turtle is omnivorous and considered a dietary generalist (Holland 1994, p. 2-5), consuming a wide variety of food items. Prey resources are primarily found within water but can be captured or scavenged on land. Food captured or scavenged on land must be brought back to water for consumption, as they appear to be unable to swallow in the air (Holland 1994, p. 2-6). Animal matter appears to constitute a larger portion of the diet than plant material (Bury 1986, pp. 518–520; Holland 1994, pp. 2-5–2-6). Stomach contents reveal the diet consists of small aquatic invertebrates, with small vertebrates (fish, tadpoles, and frogs), carrion, and plant material (Bury 1986, p. 516; Holland 1994, pp. 2-5–2-6). Nonnative predators include American bullfrogs (*Lithobates catesbeianus*; hereafter bullfrogs) and invasive fish, such as large and smallmouth bass (*Micropterus* sp.; hereafter bass). Native predators of western pond turtles include raccoons, skunks, foxes, coyotes. mink, herons, river otters, burrowing small mammals, and giant water bugs.

Southwestern pond turtles mature slowly and have low fecundity but are potentially long-lived. In southern California, the smallest known reproductive female was approximately 4.37 inches carapace length and at least 6 to 7 years old (Holland 1994, p. 5-2). Courtship behaviors have been observed from April through November, with mating observed in May through September (Holland 1991, p. 23). Oviposition usually occurs from May through July (Bury et al. 2012, p. 15). Clutch size for western pond turtles varies from 1 to 13 eggs, and is positively correlated with body size (Holland 1994, p. 5-2; Holte 1998, p. 5). Incubation time is approximately 80 to 126 days (Holland 1994, pp. 2-10, 5-7). Western pond turtles exhibit temperature-dependent sex determination (TSD) during incubation (Ewert et al. 1994, p. 7). In California, female hatchlings were more likely when 30 percent of the sex-determining period occurred above 84 degrees Fahrenheit (Christie and Geist 2017:49). In addition, lower fluctuations in temperature resulted in development of males, whereas females developed in nests with high and low temperature fluctuations. In southern and central California, some hatchlings may emerge from the nest chamber in late-summer to early-fall, whereas others overwinter in the nest chamber and emerge in spring (Holland 1994, p. 2-10). The maximum lifespan of western pond turtles is unknown. However, they are long-lived species after reaching adulthood, with some northwestern pond turtles living to at least 55 years of age (Bury et al. 2012, p. 17).

Home range size and configuration varies between age class, sex, and location. Measured home ranges of western pond turtles average 2.5 acres for males, 0.7 acre for females, and 1 acre for juveniles (Bury 1972, entire). Female pond turtles in two southern California streams had home ranges that were longer and smaller (Goodman and Stewart 2000) than those observed by Bury (1972, entire), likely because the streams in southern California tend to be narrower so pond turtles have to move further distances to obtain sufficient resources. Western pond turtles are capable of dispersing substantial distances, although large overland movements are uncommon. The longest overland distance recorded in an area considered to be under the best circumstances (mild climate and short distances between water features), was a single individual travelling 3.11 miles. Holland (1994, p. 2-9), also states that no movements between drainages were detected from three other sites with over 1,100 hundred captures and recaptures over a 7-year period. During an extreme drought, Purcell et al. (2017, pp. 21, 24) documented a 1.62 miles straight-line distance movement overland in a radio-tagged turtle, with a minimum total distance of 2.05 miles moved before the individual found water.

Population Status

The historical range of western pond turtles extends along the Pacific coast from British Columbia, Canada to the northern part of Baja California, Mexico, primarily west of the Sierra Nevada and Cascade ranges (Ernst and Lovich 2009, p. 173; Stebbins and McGinnis 2018, p. 205). Western pond turtles have been found at sites from brackish estuarine waters at sea level up to 6,719 feet (Ernst and Lovich 2009, p. 176) but mostly occur below 4,980 feet (Stebbins and McGinnis 2018, p. 205). The range of the southwestern pond turtle is restricted to those populations inhabiting the central Coast Range south from the middle of Monterey Bay to the species' southern range boundary in Baja California. A new population found south of the nearest reported population represents a range extension of 59.34 miles (and the only oasis population within the Central Desert ecoregion in Baja California) (Valdez-Villavicencio et al. 2016, p. 265).

Shaffer and Scott (2022, entire) clarified areas of previous uncertainty immediately south, east, and west of the San Francisco Bay, where there were no specimens used in Spinks et al. (2014, p. 2233) when describing northwestern and southwestern pond turtles, and the range around the San Francisco Bay presented in Thomson et al. (2016, p. 297). Based on these genomic data, Shaffer and Scott recommended that the border along the coast between the two species was in the middle of Monterey Bay (Shaffer and Scott 2022, p. 5). It also clarified the contact zone between the two species at the edge of the South Coast Ranges where they meet the floor of the Central Valley; although there are individuals with genetics from both species along the area where the species come into contact in this area, it appears that the boundaries are adjacent but do not overlap (Shaffer and Scott 2022, pp. 4–5).

Recovery Plan Information

Habitat destruction and alternation are primary threats to the southwestern pond turtle. Extensive land conversion due to urbanization and agriculture has resulted in substantial losses to both upland and aquatic habitats across the range (Holland 1994, p. 1-23; Hays et al. 1999, pp. ix, 31; Spinks et al. 2003, p. 258; Bury and Germano 2008, p. 001.6; Rosenberg et al. 2009, p. 40; Thomson et al. 2016, pp. 300–301). As a result, a large fraction of the remaining habitat in southern California existing only as patches with little suitable upland habitat available for nesting (Thomson et al. 2016, p. 301). Overall, the range of the southwestern pond turtle is fragmented to varying degrees by human activities, with some sites extirpated, and in many cases, only small, isolated groups or individuals remaining (Holland 1991, p. 13).

Aquatic resources used by the western pond turtle have experienced high levels of loss, alteration, and degradation throughout the range of the two species (Reese and Welsh Jr. 1998b, p. 505; Germano 2010, p. 89). A substantial portion of the losses of aquatic habitat are due to anthropogenic water use (e.g., dams and diversions for the purposes of providing water for human use). Moreover, within the historical range of the western pond turtle, an extensive system of hydrologic infrastructure, including dams, reservoirs, diversions, and aqueducts, supports extensive agricultural and municipal water uses, and provides domestic water to many densely populated areas (Lund et al. 2007, p. 43; Hanak et al. 2011, pp. 19–69). These alterations include stream channelization, altered flow regimes, groundwater pumping, water diversions, damming, and water regulation for flood risk management (flood control), which affect hydrology, thermal conditions, and structure of western pond turtle aquatic and upland habitat.

Loss of upland habitat adjacent to southwestern pond turtle aquatic habitat can isolate pond turtles from surrounding populations and eliminate nesting sites, thus limiting the ability to successfully reproduce (Holland 1994, entire; Spinks et al. 2003). Agricultural areas and grazing pastures provide suitable habitat for nesting southwestern pond turtles, but certain practices, such as plowing and irrigation, could destroy nests (Crump 2001, entire). Western pond turtle eggs have permeable shells that have been observed to rupture after absorbing excess moisture, killing the pond turtle embryo (Feldman 1982, p. 10). For example, this could be a problem in urban areas that are irrigated (Spinks et al. 2003, p. 263).Roads can affect western pond turtle viability because of vehicles killing or injuring individuals or disturbing basking behavior, and by reducing connectivity between populations, which reduces migration between upland and aquatic habitat (Rosenberg et al. 2009, p. 41; Nyhof 2013, p. 43; Thomson et al. 2016, p. 301; Nicholson et al. 2020, entire; Manzo et al. 2021, p. 494, S1 text supplement).

Development can also indirectly lead to habitat degradation and/or mortality as a result of down cutting and erosion, introduction of non-native plants and animals, water pollution, and recreational activities (Holland 1991, entire). Increased runoff from irrigation results in down cutting and erosion which can eliminate pools, basking sites, and refugia used by pond turtles and isolates the aquatic environment from the surrounding upland environment. Invasion by nonnative aquatic plant species, such as Arundo spp. can alter the stream hydrology and displace emergent aquatic vegetation that provides refuge for juvenile turtles. Introduced non-native and urban-related animals include predators (e.g., non-native fish, bullfrogs, crayfish, dogs, and corvids) and competitors (e.g., non-native turtles, such as the red-eared slider).

Recreational activities such as hiking, biking, fishing, boating, and off-highway vehicles, and the associated disturbance within or adjacent to aquatic and nest habitats, can affect western pond turtles in a variety of ways, depending on the region and type of recreation. Some forms of recreation may cause mortality of individuals through trampling, while others degrade habitat, disturb pond turtle behavior, and/or contribute to other threats. For example, recreational activities may interact with the threat of collection because humans may encounter the species while engaging in other activities. Western pond turtles are extremely wary and will rapidly flee from basking sites into the water when disturbed by the sight or sound of people at distances of greater than 328 feet (Bury and Germano 2008, p. 001.5).

Desiccation of waterways from drought has led to declines and extirpations of western pond turtle populations by negatively affecting the quality and/or quantity of its aquatic habitat, impacting survival, recruitment, and connectivity, and exacerbating the effects of other threats. Western pond turtle mortality during drought is well documented, and appears to occur as a result of drought-induced starvation (Lovich et al. 2017, p. 7) and/or drought-induced predation (Purcell et al. 2017, p. 21). Extended drought occurring during 1986–1987 through at least 1991 caused major population declines and extirpations in many areas, but most significantly in southern and central California (Holland 1991, p. 65). During this time, turtles in small to moderate sized watercourses were fairly abundant until 1988–1989, but as water continued to dry, resulting in major increases in distance to the next water source, turtles concentrated in the few remaining pools exhausted available prey, and were exposed to increased predation.

During normal drought conditions, when water levels are low, western pond turtles can aestivate in upland habitat or move to another water body if one is within migration and/or dispersal distance. Aestivating southwestern pond turtles remained in upland habitat for approximately 7 months (mean 201 days, range 154 to 231 days) during the 2011–2012 drought (Belli 2016, p. 57), suggesting that even in a severe drought, individuals could remain alive to repopulate the water body once conditions become suitable again (see Purcell et al. 2017, entire). However, extended drought conditions and/or increased frequency of droughts, could have substantive effects on populations, and other synergistic effects could also make repopulation by aestivating individuals unlikely. In addition, because females often forego nesting when conditions are unfavorable, extended drought can result in reduced reproduction and recruitment opportunities.

The conservation needs for western pond turtles include conserving large blocks of suitable aquatic and associated upland habitat and maintaining connectivity by providing suitable habitat linkages for dispersal. Management activities that address threats to this species include controlling nonnative plants such as *Arundo donax*, controlling non-native aquatic predators and competitors such as fish, bullfrogs, crayfish, and red-eared sliders, and limiting predation by urban predators, such as dogs, ravens, coyotes, and raccoons (Service 2023b, pp. 48, 50-51, 61). Bullfrogs have been introduced into western pond turtle habitat and influence viability of the species by increasing predation pressure on hatchlings and small juveniles, and thus are considered to have the largest impact on western pond turtle demography (Service 2023b, pp. 87-88, 89-90, 95). Because of the potential threat posed by road mortality, measures such as the installation of low-lying fine-mesh fence or barrier fencing in areas likely to be used by pond turtles may help minimize this source of mortality. In addition, because pond turtles may be collected as pets or non-native red-eared sliders purchased from the pet store could be released into the wild, public education regarding these effects would benefit this species.

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Amphibians

Arroyo Toad

Listing Status

The Service listed the arroyo toad as endangered on December 16, 1994 (Service 1994). On February 9, 2011, the Service designated approximately 98,366 acres of critical habitat for the arroyo toad (Service 2011). At the time of listing, the primary threats to arroyo toads were urban development, agricultural conversion, operations of dams and water flow, roads and road maintenance, recreational activities, introduced predators, and droughts.

Life History and Habitat

The arroyo toad is a small, light-olive green or gray to tan toad with dark spots and warty skin. Arroyo toads are terrestrial for much of the year and can range widely into upland habitat for foraging and burrowing but use aquatic habitat for breeding. Breeding occurs in shallow, slow-moving stream systems and may occur from January to July. Breeding tends to occur earlier in coastal areas than inland areas (Service 1999).

Population Status

Thirty-five populations of arroyo toad are distributed from Monterey County, California, in the United States south to Baja California, Mexico (Service 2015). Urbanization, agriculture, and dams are the main reasons for the decline of arroyo toad and are also current threats. Other threats include water management activities and diversions; road construction, maintenance, and use; grazing; mining; recreation; and nonnative plants and animals (Service 1999). Decline in number of populations of arroyo toads has already occurred (Jennings and Hayes 1994, p. 57 in Service 2015), and new data indicate that the species has continued to decline in numbers and in area occupied within its current range (Hancock 2007–2014, entire; Hollingsworth in litt. 2014; USGS in litt. 2014; Sweet 2015, pers. comm.; USGS 2015, pers. comm., all In Service 2015).

Recovery Plan Information

A recovery plan for the species was published in 1999 (Service 1999). The recovery strategy for the arroyo toad is focused on providing sufficient breeding and upland habitat to maintain self-sustaining populations of arroyo toads throughout the historic range of the species in California and minimizing or eliminating impacts and threats to arroyo toad populations. The recovery strategy for the arroyo toad consists of five parts: 1) stabilize and maintain populations throughout the range of the arroyo toad in California by protecting sufficient breeding and nonbreeding habitat, 2) monitor the status of existing populations to ensure recovery actions are successful, 3) identify and secure, by appropriate management and monitoring, additional suitable arroyo toad habitat and populations, 4) conduct research to determine the population dynamics and ecology of the species to guide management efforts and determine the best methods for reducing threats, and 5) develop and implement an outreach program.

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California Red-legged Frog and its Critical Habitat

Listing Status

The California red-legged frog was listed as a threatened species on May 23, 1996 (USFWS 1996). Critical habitat was designated for this species on April 13, 2006 (USFWS 2006), with revisions to the critical habitat designation published on March 17, 2010 (USFWS 2010). At that time, the Service recognized the taxonomic change from *Rana aurora draytonii* to *Rana draytonii* (Shaffer et al. 2010).

Life History and Habitat

Habitat

The California red-legged frog generally breeds in still or slow-moving water associated with emergent vegetation, such as cattails, tules (hardstem bulrush), or overhanging willows (Storer 1925; Fellers 2005). Aquatic breeding habitat predominantly includes permanent water sources such as streams, marshes, and natural and manmade ponds in valley bottoms and foothills (Jennings and Hayes 1994; Bulger et al. 2003; Stebbins 2003). Since the 1850's, manmade ponds may actually supplement stream pool breeding habitat and can be capable of supporting large populations of this species. Breeding sites may hold water only seasonally, but sufficient water must persist at the beginning of the breeding season and into late summer or early fall for tadpoles to successfully complete metamorphosis. Breeding habitat does not include deep lacustrine water habitat (e.g., deep lakes and reservoirs 50 acres or larger in size) (USFWS 2010). Within the coastal lagoon habitats, salinity is a significant factor on embryonic mortality or abnormalities (Jennings and Hayes 1990). Jennings and Hayes (1990) conducted laboratory studies and field observations concluding salinity levels above 4.5 parts per thousand detrimentally affected the California red-legged frog embryos. Aquatic breeding habitat does not need to be available every year, but it must be available at least once within the frog's lifespan for breeding to occur (USFWS 2010).

Non-breeding aquatic habitat consists of shallow (non-lacustrine) freshwater features not suitable as breeding habitat, such as seasonal streams, small seeps, springs, and ponds that dry too quickly to support breeding. Non-breeding aquatic and riparian habitat is essential for providing the space, food, and cover necessary to sustain the California red-legged frog. Riparian habitat consists of vegetation growing nearby, but not typically in, a body of water on which it depends, and usually extends from the bank of a pond or stream to the margins of the associated floodplain (USFWS 2010). Adult California red-legged frogs may avoid coastal habitat with salinity levels greater than 6.5 parts per thousand (Jennings and Hayes 1990).

Cover and refugia are important habitat characteristic preferences for the species (Halstead and Kleeman 2017). Refugia may include vegetation, organic debris, animal burrows, boulders, rocks, logjams, industrial debris, or any other object that provides cover. Agricultural features such as watering troughs, spring boxes, abandoned sheds, or haystacks may also be utilized by the species. Incised stream channels with portions narrower and depths greater than 18 inches may also provide important summer sheltering habitat. During periods of high water flow, California red-legged frogs are rarely observed; individuals may seek refuge from high flows in pockets or small mammal burrows beneath banks stabilized by shrubby riparian growth (Jennings and Hayes 1994). Accessibility to cover habitat is essential for the survival of California red-legged frogs within a watershed and can be a factor limiting frog population numbers and survival.

Breeding

In the Coast Range and at lower elevations, the California red-legged frog typically breeds between November and April (Storer 1925; Jennings and Hayes 1994; Fellers 2005). However, breeding phenology varies by location and across years, largely based on differences in climatic conditions (McHarry et al. 2019). At sites that routinely experience winter temperatures below freezing, the beginning of breeding is generally corresponded with the onset of spring's warmer air temperatures, such as in the Sierra Nevada where breeding typically occurs in late February and March (McHarry et al. 2019). Dependent on weather conditions, breeding in the Sierra Nevada can occur into late April (Barry 2002).

Females deposit their egg masses on emergent vegetation, floating on or near the surface of the water. The California red-legged frog is often a prolific breeder, laying eggs during or shortly after large rainfall events. Egg masses containing 300-4,000 eggs hatch after six to fourteen days (Storer 1925; Jennings and Hayes 1994; Fellers 2005). Historically, the California red-legged frog in the Sierra Nevada likely bred within stream pools, which tend to be small with limited forage, constraining the size and number of populations (Barry and Fellers 2013).

California red-legged frog tadpoles undergo metamorphosis three to seven months following hatching. Most males reach sexual maturity in two years, while it takes approximately three years for females (Jennings and Hayes 1985; Fellers 2005). Under favorable conditions, California red-legged frogs may live eight to ten years (Jennings et al. 1992). Of the various life stages, tadpoles likely experience the highest mortality rates; only one percent of each egg mass completes metamorphosis (Jennings et al. 1992).

<u>*Diet*</u>

The California red-legged frog has a variable diet that changes with each of its life history stages. The feeding habits of the early stages are likely similar to other ranids, whose tadpoles feed on algae, diatoms, and detritus by grazing on the surface of rocks and vegetation (Fellers 2005). Hayes and Tennant (1985) found invertebrates to be the most common food items of adult California red-legged frogs collected in southern California; however, they speculated that this was opportunistic and varied based on prey availability. Vertebrates, such as Pacific tree frogs (*Pseudacris regilla*) and California mice (*Peromyscus californicus*), represented over half of the prey mass eaten by larger frogs, although invertebrates were the most numerous food items. Feeding typically occurs along the shoreline and on the surface of the water; juveniles appear to forage during both daytime and nighttime, whereas adults appear to feed at night (Hayes and Tennant 1985).

<u>*Movement*</u>

California red-legged frogs do not have a distinct breeding migration (Fellers 2005), rather they may move seasonally from non-breeding pools or refugia to breeding pools. Some individuals remain at breeding sites year-round while others disperse to neighboring water features or moist upland sites when breeding is complete and/or when breeding pools dry (USFWS 2002; Bulger et al. 2003; Fellers and Kleeman 2007; Tatarian and Tatarian 2008; Tatarian 2008). Studies in the several San Francisco Bay counties showed movements are typically along riparian corridors (Fellers and Kleeman 2007; Tatarian 2008). Although, some individuals, especially on rainy nights and in more mesic areas, travel without apparent regard to topography, vegetation type, or riparian corridors, and can move directly from one site to another through normally inhospitable habitats such as heavily grazed pastures or oak-grassland savannas (Bulger et al 2003).

California red-legged frogs show high site fidelity (Tatarian and Tatarian 2008) and typically do not move significant distances from breeding sites (Bulger et al. 2003; Fellers and Kleeman 2007; Tatarian and Tatarian 2008; Tatarian 2008). When traveling between aquatic sites, California red-legged frogs typically travel less than 0.31 miles (Fellers and Kleeman 2007; Tatarian and Tatarian 2008), although they have been documented to move more than two miles in Santa Cruz County (Bulger et al. 2003). Various studies have found that the frogs typically do not make terrestrial forays further than 200 feet from aquatic habitat (Bulger et al. 2003; Fellers and Kleeman 2007; Tatarian and Tatarian 2008; Tatarian 2008). Upland movements are typically associated with precipitation events and usually last for one to four days (Tatarian 2008).

Population Status

Rangewide Status of the Species

The historical range of the California red-legged frog extended from central Mendocino County and western Tehama County south in the California Coast Range to northern Baja California, Mexico, and in the Sierra Nevada/Cascade Ranges from Shasta County south to Madera County (Jennings and Hayes 1994). The species historically occurred from sea level to elevations of about 5,200 feet in 46 counties; however, currently the taxon is extant in 238 streams or drainages within only 22 counties, representing a loss of 70 percent of its former range (USFWS 2002). Isolated populations persist in several Sierra Nevada foothill locales and in Riverside County (Barry and Fellers 2013; Backlin et al. 2017; CDFW 2017; Gordon, R. and J. Bennett, pers. comm., 2017). The species is no longer considered extant in California's Central Valley due to significant declines caused by habitat modifications and exotic species (Fisher and Shaffer 1996). Currently, the California red-legged frog is widespread in the San Francisco Bay nine-county area (CDFW 2017). They are still locally abundant within the California coastal counties from Mendocino County to Los Angeles County and presumed extirpated in Orange and San Diego counties (CDFW 2017; Yang, D. and J. Martin, pers. comm., 2017; Gordon, R. and J. Bennett, pers. comm., 2017). Baja California represents the southernmost edge of the species' current range (Peralta-García et al. 2016).

Barry and Fellers (2013) conducted a comprehensive study to determine the current range of the California red-legged frog in the Sierra Nevada, concluding that it differs little from its historical range; however, the current Sierra Nevada populations appear to be small and tend to fluctuate. Since 1991, eleven California red-legged frog populations have been discovered or confirmed, including eight probable breeding populations (Barry and Fellers 2013; Mabe, J., pers. comm., 2017). Microsatellite and mitochondrial DNA analysis by Richmond et al. (2014) confirmed the Sierra Nevada populations of the California red-legged frog are genetically distinct from each other, as well as from other populations throughout the range of this species. The research concluded that the Sierra Nevada populations are persisting at low levels of genetic diversity and no contemporary gene flow across populations exist. On a larger geographic scale, range contraction has left a substantial gap between Sierra Nevada and Coast Range populations, similar to the gap separating the Southern California and Baja California populations (Richmond et al. 2014).

Population Summary

Number of distinct occurrences (subpopulations) is unknown but probably is at least several dozen. According to USFWS (2000), the species occurs in about 238 streams or drainages. In the mid-1990s, most of the occupied habitat was in Monterey, San Luis Obispo, and Santa Barbara counties; the species occurred in only 5 sites south of the Tehachapi Mountains (80+ historic sites) (USFWS 1996). Aggregations including more than 350 adults were known only from Pescadero Marsh Natural Preserve in coastal San Mateo County, Point Reyes National Seashore in Marin County, and Rancho San Carlos in Monterey County (USFWS 1996). More than 120 breeding sites exist in Marin County (Fellers 2005). In California, south of Los Angeles, a single population is known from the Santa Rosa Plateau in

Riverside County (Shaffer et al. 2004). Only two populations are known to exist south of Santa Barbara (Fellers 2005). In the Sierra Nevada, *Rana draytonii* is now represented by only about a half dozen populations, only one of which is known to have more than 10 breeding adults (Shaffer et al. 2004).

Over the long term, extent of occurrence, area of occupancy, number of subpopulations, and population size have undergone a major decline. The species has been extirpated from much of its former range in California (Hayes and Jennings 1988, Shaffer et al. 2004). Range has been reduced by 70% (USFWS 1996, USFWS 2000). Total adult population size is unknown but undoubtedly exceeds 10,000. The species is still locally abundant in portions of the San Francisco Bay area and the central coast (USFWS 2000). Breeding sites in Marin County include several thousand adults (Fellers 2005).

Threats

Factors associated with declining populations of the California red-legged frog throughout its range include degradation and loss of habitat through agriculture, urbanization, mining, overgrazing, recreation, timber harvesting, non-native species, impoundments, water diversions, erosion and siltation altering upland and aquatic habitat, degraded water quality, use of pesticides, and introduced predators (USFWS 2002, USFWS 2010). Urbanization often leaves isolated habitat fragments and creates barriers to frog dispersal.

Non-native species pose a major threat to the recovery of California red-legged frogs. Several researchers have noted the decline and eventual local disappearance of California and northern red-legged frogs in systems supporting bullfrogs (Jennings and Hayes 1990; Twedt 1993), red swamp crayfish, signal crayfish, and several species of warm water fish including sunfish, goldfish, common carp, and mosquitofish (Moyle 1976; Barry 1992; Hunt 1993; Fisher and Shaffer 1996). The decline of the California red-legged frog due to these non-native species has been attributed to predation, competition, and reproduction interference (Twedt 1993; Bury and Whelan 1984; Storer 1933; Emlen 1977; Kruse and Francis 1977; Jennings and Hays 1990; Jennings 1993).

Chytridiomycosis, an infectious disease caused by the chytrid fungus, *Batrachochytrium dendrobatidis* (*Bd*), has been found to adversely affect amphibians globally (Davidson et al. 2003; Lips et al. 2006). While *Bd* prevalence in wild amphibian populations in California is unknown (Fellers et al. 2011), chytrid is expected to be widespread throughout much of the California red-legged frog's range. The chytrid fungus has been documented within the California red-legged frog populations at Point Reyes National Seashore, two properties in Santa Clara County, Yosemite National Park, Hughes Pond, Sailor Flat, Big Gun Diggings, and Spivey Pond (Padgett-Flohr and Hopkins 2010; Tatarian and Tatarian 2010; Fellers et al. 2011; Barry and Fellers 2013). However, no chytrid-related mortality has been reported in these populations, suggesting that California red-legged frogs are less vulnerable to the pathogenic effects of chytrid infection than other amphibian species (Tatarian and Tatarian 2010; Barry and Fellers 2013; Fellers et al. 2017). While chytrid infection may not directly lead to mortality in California red-legged frogs, Padgett-Flohr (2008) states that this infection may reduce overall fitness and could lead to long-term effects. Therefore, it is difficult to estimate the full extent and risk of chytridiomycosis to the California red-legged frog populations.

Five-Year Status Review

On June 18, 2018, the U.S. Fish and Wildlife Service made a notification of initiation of 5-year status reviews for the 50 species in California, Nevada, and the Klamath Basin of Oregon, including the California red-legged frog.

Critical Habitat

Critical habitat was designated for this species on April 13, 2006 (USFWS 2006), with revisions to the critical habitat designation published on March 17, 2010 (USFWS 2010). In total, approximately 1,636,609 acres (ac) (662,312 hectares (ha)) of critical habitat in 27 California counties fall within the boundaries of the final revised critical habitat designation.

The PCEs of critical habitat for the California red-legged frog are the habitat components that provide:

1) Aquatic Breeding Habitat. Standing bodies of fresh water (with salinities less than 4.5 ppt), including natural and manmade (e.g., stock) ponds, slow-moving streams or pools within streams, and other ephemeral or permanent water bodies that typically become inundated during winter rains and hold water for a minimum of 20 weeks in all but the driest of years (USFWS 2010).
2) Aquatic Non-Breeding Habitat. Freshwater pond and stream habitats, as described above, that may not hold water long enough for the species to complete its aquatic lifecycle, but which provide for shelter, foraging, predator avoidance, and aquatic dispersal of juvenile and adult California red-legged frogs. Other wetland habitats considered to meet these criteria include but are not limited to: plunge pools within intermittent creeks, seeps, quiet water refugia within streams during high water flows, and springs of sufficient flow to withstand short-term dry periods (USFWS 2010).
3) Upland Habitat. Upland areas adjacent to or surrounding breeding and non-breeding aquatic and riparian habitat up to a distance of 1 mi (1.6 km) in most cases (i.e., depending on surrounding landscape and dispersal barriers) including various vegetational types such as grassland, woodland, forest, wetland, or riparian areas that provide shelter, forage, and predator avoidance for the California red-legged frog. Upland features are also essential in that they are needed to maintain the hydrologic, geographic, topographic, ecological, and edaphic features that support and surround the aquatic, wetland, or riparian habitat. These upland features contribute to: (1) Filling of aquatic, wetland, or riparian habitats; (2) maintaining suitable periods of pool inundation for larval frogs and their food sources; and (3) providing nonbreeding, feeding, and sheltering habitat for juvenile and adult frogs (e.g., shelter, shade, moisture, cooler temperatures, a prey base, foraging opportunities, and areas for predator avoidance). Upland habitat should include structural features such as boulders, rocks and organic debris (e.g., downed trees, logs), small mammal burrows, or moist leaf litter (USFWS 2010).
4) Dispersal Habitat. Accessible upland or riparian habitat within and between occupied or previously occupied sites that are located within 1 mi (1.6 km) of each other, and that support movement between such sites. Dispersal habitat includes various natural habitats, and altered habitats such as agricultural fields, that do not contain barriers (e.g., heavily traveled roads without bridges or culverts) to dispersal. Dispersal habitat does not include moderate- to high-density urban or industrial developments with large expanses of asphalt or concrete, nor does it include large lakes or reservoirs over 50 ac (20 ha) in size, or other areas that do not contain those features identified in PCE 1, 2, or 3 as essential to the conservation of the species (USFWS 2010).

Recovery Plan Information

The Service's *Recovery Plan for the California red-legged frog (Rana aurora draytonii)* (Recovery Plan) was published for the California red-legged frog on September 12, 2002 (USFWS 2002). The Recovery Plan identifies eight recovery units (USFWS 2002). The goal of the Recovery Plan is to protect the long-term viability of all extant populations within each recovery unit. Within each recovery unit, delineated core areas, designed to protect metapopulations, represent contiguous areas of moderate to high California red-legged frog densities. The management strategy identified within this Recovery Plan will allow for the recolonization of habitats within and adjacent to core areas naturally subjected to periodic localized extinctions, thus assuring the long-term survival and recovery of California red-legged frogs.

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California Tiger Salamander, Central California DPS and its Critical Habitat

Listing Status

The Service listed the California tiger salamander, Central California DPS as threatened on August 4, 2004 (69 FR 47212). The Service designated critical habitat for the California tiger salamander, Central California DPS on August 23, 2005 (70 FR 49380).

Life History and Habitat

Habitat Requirements

Egg: California tiger salamanders breed in deeper vernal pools and wetlands that have sufficiently long periods of inundation to prevent stranding/desiccation. Eggs are attached to a substrate such as twigs, grass stems, or other vegetation or debris (Service 2014).

Larvae: Ponding duration is an important factor for breeding success. Wetlands must have a long enough ponding duration for California tiger salamander larvae to mature into juveniles capable of dispersing from the aquatic breeding site to suitable terrestrial habitat. This typically takes 3 months or more and will vary depending on factors such as water temperature and the depth of the breeding ponds (Service 2014).

Adult: California tiger salamander populations are strongly correlated with small burrowing mammal communities, particularly California ground squirrel (*Otospermophilus beecheyi*) and Botta's pocket gopher (*Thommomys bottae*). Adult California tiger salamanders spend roughly 90 percent of any given year underground. Most evidence suggests that California tiger salamanders remain active in their underground dwellings. California tiger salamanders appear to have high site fidelity, returning to their natal pond as adults. After breeding, they commonly return to the same terrestrial habitat areas (Service 2014). Although California tiger salamanders are adapted to natural vernal pools and ponds, they now frequently use livestock ponds and other modified ephemeral and permanent ponds surrounded by large tracts of land dominated by grassland, oak savanna, or oak woodland. California tiger salamanders breed in deeper vernal pools and wetlands that have sufficiently long periods of inundation. Breeding pools typically have moderate to high levels of turbidity; California tiger salamanders rarely use ponds with clear water. This species is not known to breed in streams or rivers; however, breeding populations have been reported in ditches that contain seasonal wetlands, and have been documented in sewage treatment ponds in Calaveras County. There has been a shift in habitat use from vernal pools on valley floors to livestock ponds and other artificial wetlands in the foothills (Service 2014). Geographic barriers include heavily traveled roads, especially at night during salamander breeding season, so that salamanders almost never successfully traverse the road; roads with a barrier that is impermeable to salamanders; wide, fast rivers; and areas of intensive development dominated by buildings and pavement (NatureServe 2015).

Dispersal/Migration

Peak periods for metamorphs to leave their natal ponds have been reported from May to July. Once metamorphosis occurs, juveniles often depart their natal ponds at night and enter into terrestrial habitat in search of underground burrows. Although wet conditions are more favorable for upland travel, metamorphs typically travel during dry weather because summer rain events seldom occur as metamorphosis is completed and ponds begin to dry. However, if a rain event does occur, it is likely that it will trigger a mass emergence from the natal pond (Service 2014). The mean distance that juveniles travel before settling in a burrow is 26 m (85 ft.); dispersal into terrestrial habitat occurs randomly with respect to direction (Service 2014). After breeding events, adults and juveniles disperse from the breeding pond in search of small burrowing mammal communities, particularly California ground squirrel (*Otospermophilus beecheyi*) and Botta's pocket gopher (*Thommomys bottae*), or in their absence (especially as recent metamorphs), soil cracks (Service 2014). The average dispersal distance is estimated to be 562 m (1,844 ft.). The mean distance adults travel before settling into a burrow is 35.9 m (118 ft.). During the breeding season, rainstorms precede major migrations to breeding sites, with most migrations occurring on rainy nights. Adult California tiger salamanders migrate up to about 2 km (1.25 mi.) between terrestrial habitat and breeding pond (NatureServe 2015; Service 2014). However, estimates suggest California tiger salamanders are physiologically capable of migrating up to 1.5 mi. (2.4 km) during a breeding season, and an estimated 95 percent of California tiger salamander populations are thought to occur within 1.86 km (1.16 mi.) of a breeding pond (Service 2014).

Reproduction

Egg: Females attach their eggs singly or, in rare circumstances, in groups of two to four (68 FR 28648). After deposition, California tiger salamander eggs hatch in 10 to 28 days; the amount of time for hatching is likely related to water temperatures (Service 2014).

Adult: With the onset of the breeding season, typically from November through April (although migrating adults can be observed as early as October and as late as May), adult salamander leave their refugia during rain and storm events in search of breeding ponds (e.g., ephemeral/vernal or perennial water). Males typically arrive before the females, generally remaining in the ponds longer (average of 44.7 days) than the females (average of 11.8 days). The male deposits a spermatophore on the bottom of the pond, which the female picks up and uses to fertilize her eggs internally. Females then attach their eggs to twigs, grass stems, or other vegetation or debris (Service 2014). Breeding adults usually range from 1 (rare) or 2 years (typical) old, up to 4 to 5 years of age; females breed an estimated 1.4 times in their lifetime (up to 10 years or more). Given that an estimated 8.5 young survive to metamorphosis per reproductive event, a female's reproductive capacity averages roughly 12 metamorphic offspring over its lifetime (Service 2014).

Feeding

Larvae: The California tiger salamander larvae is an opportunistic invertivore/carnivore and is among the top aquatic predators in the seasonal pool ecosystems. The larvae prey on zooplankton, small crustaceans, and aquatic insects, moving toward larger prey such as the tadpoles of Sierran tree frog (*Pseudacris sierra*), western spadefoot (*Spea hammondii*), and California red-legged frogs (*Rana draytonii*) as they grow in size (Service 2014). The larvae often rest on the bottom in shallow water, but also may be found at different layers in the water column in deeper water. The young salamanders are wary; when approached by potential predators, they will dart into vegetation on the bottom of the pool (68 FR 28648). Typical competitors include nonnative and hybrid tiger salamanders and western mosquitofish (*Gambusia affinis*), which can outcompete larvae when they occur (Service 2014). Larvae feed for about 6 to 8 weeks after hatching, after which they switch to larger prey (Service 2014). The larval stage of the California tiger salamander usually lasts 3 to 6 months, with metamorphosis beginning in late spring or early summer (Service 2014). Larvae develop faster in smaller, more rapidly drying pools. The developmental period is prolonged in colder weather and in larger pools; larvae development (time from eggs laid to larvae leaving the pond) has been observed taking from 74 days to 94 days (Service 2014).

Adult: The California tiger salamander adult is an opportunistic invertivore/carnivore, foraging predominantly underground during the dry summer months. Invertebrate prey items found in adult salamander stomachs include aphids (Aphididae), wood cockroaches (Blattellidae), ground beetles (Carabidae), springtails (Collembola), centipedes (Cryptopidae, Lithobiidae, and Scolopendra), true weevils (Curculionidae), webspinners (Embioptera), wasps/bees/ants (Hymenoptera), woodlice (Isopoda), silverfish (Lepismatidae), wolf spiders (Lycosidae), owlet moths (Noctuidae), harvestmen (Opiliones), crickets (Rhaphidophoridae), scarab beetles (Scarabaeidae), and crane flies (Tipula). Most evidence suggests that California tiger salamanders remain active in their underground dwellings during the summer months, making frequent underground movements in burrow systems of less than 33 ft. (10 m), but otherwise remaining underground until the onset of rain and the winter months (Service 2014).

Population Status

Rangewide Status of the Species

Historically, California tiger salamanders were endemic to the San Joaquin-Sacramento River valleys, bordering foothills, and coastal valleys of Central California. Although the historical distribution of California tiger salamanders is not known in detail, their current distribution suggests that they may have been continuously distributed along the low-elevation grassland-oak woodland plant communities of the valleys and foothills. In this area, the species is known from sites on the Central Valley floor near sea level, up to a maximum elevation of roughly 1,200 meters (m) (3,940 feet [ft.]) in the Coast Ranges and 500 m (1,640 ft.) in the Sierra Nevada foothills (Service 2014).

The California tiger salamander – Central California DPS is currently restricted to the Central Valley and Inner Coast Range, from Tulare and San Luis Obispo counties in the south to Sacramento and Yolo counties in the north, and including Alameda, Amador, Calaveras, Contra Costa, Fresno, Kern, Kings, Madera, Mariposa, Merced, Monterey, San Benito, San Mateo, San Joaquin, Santa Clara, Santa Cruz, Stanislaus, Solano, and Tuolumne counties (68 FR 28648). However, along the Central Valley floor, urbanization and intensive agriculture has eliminated virtually all valley grassland and oak savanna habitat from the Central Valley floor; grasslands and, consequently, Central California tiger salamanders are now distributed primarily in a ring around the Central Valley. Likewise, there has also been a significant increase in elevation of localities, suggesting that low-elevation breeding sites have been eliminated where valley floor habitat has been lost (Service 2014).

As of 2017, the Central California tiger salamander occurs in the following counties: Alameda, Amador, Calaveras, Contra Costa, Fresno, Kern, Kings, Madera, Mariposa, Merced, Monterey, Sacramento, San Benito, San Mateo, San Joaquin, San Luis Obispo, Santa Clara, Santa Cruz, Stanislaus, Solano, Tulare, Tuolumne, and Yolo (Service 2017).

Population Summary

Both the California tiger salamander (Central California DPS) population levels and the overall California tiger salamander species are decreasing; the total adult population size is unknown, but certainly exceeds 10,000 and likely is at least several 10,000s (NatureServe 2015). The correlation between declining California tiger salamander numbers and surrounding urban and agricultural land uses has been well documented. As of 2002, there was a 20.7 percent loss of known Central California DPS records as a result of habitat loss and degradation. However, because the species spends a majority of its life underground and may not breed every year (= low detectability), it is difficult to determine the exact number of California tiger salamander populations that have been lost due to habitat conversion (Service 2014). Although the number of individual extant occurrences of California tiger salamander (Central California DPS) have increased from 638 to 867 since the DPS was first listed in 2004, these do not necessarily correlate with an improvement in status or a reduction in threats to the California tiger salamander; many of these ponds (occurrences) are likely threatened by development, or may have already been destroyed or degraded as a result of development projects. The available data suggest that most populations consist of relatively small numbers of breeding adults; breeding populations in the range of a few pairs up to a few dozen pairs are common, and numbers above 100 breeding individuals are rare.

As of 2012, general occurrence data derived from the California Natural Diversity Data Base indicate that there are 257 extant, 18 extirpated, and 12 possibly extirpated occurrences in the Bay Area population; 439 extant, 18 extirpated, and 17 possibly extirpated occurrences in the Central Valley population; 73 extant, 8 extirpated, and 7 possibly extirpated occurrences in the Southern Jan Joaquin Valley population; and 98 extant, 2 extirpated, and 2 possibly extirpated occurrences in the Central Coast Range population (Service 2014). The total adult population size is unknown, but certainly exceeds 10,000 and likely is at least several 10,000s (NatureServe 2015). Given the species' comparatively widespread distribution across the landscape, their ecological diversity/variation across their range, and their sensitivity to environmental changes, the species shows a moderate resilience to withstand stochastic events, has a moderate representation to adapt to changing environmental conditions across the landscape, a moderate redundancy to withstand catastrophic events, a low resistance to disease, and low adaptability.

Threats

Threats to this species include:

- Urban impacts include development activities such as building and maintenance of housing, commercial, and industrial developments; construction and widening of roads and highways; golf course construction and maintenance; landfill operation and expansion; operation of gravel mines and quarries; and dam building and inundation of habitat by reservoirs (Service 2014).
- Agricultural impacts include the conversion of native habitat by discing and deep-ripping; and cultivation, planting, and maintenance of row crops, orchards, and vineyards. Conversion of grasslands to intensive agricultural uses, such as vineyards, orchards, and row crops, has led to the direct loss of Central California tiger salamander populations (Service 2014).
- For example, ranavirus diseases such as *Ambystoma tigrinum* virus (ATV) and regina ranavirus (RRV) are known to cause die-offs of other *Ambystoma* species, and although not yet documented to occur in California tiger salamander in the Central California DPS, such diseases are lethal to the species in experimental conditions. If introduced (i.e., by way of nonnative tiger salamanders sold as fishing bait), such diseases could spread from a single pond to an entire metapopulation (Service 2014). California tiger salamanders are also susceptible to infection by Chytrid fungus (*Batrachochytrium dedrobatidis*), which causes infected individuals to molt (slough) their entire skin every 2 to 3 days (rather than the typical once every 1 to 2 weeks); this may help prevent mortality, but also requires more energy and reduces individual fitness (Service 2014).
- In addition to native predators (amphibians, snakes, turtles, birds, and small mammals), nonnative and exotic predators include bullfrogs (*Rana catesbeiana*); nonnative and hybrid tiger salamanders; western mosquitofish (*Gambusia affinis*) and other introduced fishes like largemouth bass (*Micropterus salmoides*) and blue gill (*Lepomis macrochirus*); nonnative crayfish species (*Pacifastacus*, *Oronectes*, and *Procambarus* spp.), all of which can prey on either the larval or adult (or both) stages of the California tiger salamander (Service 2014).
- The primary cause of the decline of the Central California tiger salamander is the loss, degradation, and fragmentation of habitat that results from human activities. There are several state and federal laws and regulations that are pertinent to the protection of Central California tiger salamanders; however, federal, state, and local laws have not been sufficient to prevent past and ongoing losses of the California tiger salamander and its habitat (Service 2014).
- The California tiger salamander – Central California DPS has been heavily affected by hybridization. The large-scale introduction of barred tiger salamander was first reported in the Salinas Valley about 60 years ago, when many tens of thousands of barred tiger salamander (*Ambystoma mavortium*) were introduced in support of the bass-bait industry (Service 2014).

- Sources of chemical pollution that may adversely affect California tiger salamander (Central California DPS) include hydrocarbon and other contaminants from oil production and road runoff; the application of chemicals for agricultural production and urban/suburban landscape maintenance; and increased nitrogen levels in aquatic habitats. Amphibians in general are extremely sensitive to contaminants, due to their highly permeable skin. Exposure to pesticides can increase their susceptibility to parasitic or bacterial infections, alter their rates of metamorphosis, lead to growth abnormalities, reduce their overall fitness, and lead to increased mortality (Service 2014).
- Because ground squirrels and pocket gophers are critical for burrow construction and maintenance, and therefore critical to the California tiger salamander, rodent population control efforts are a potential threat to California tiger salamanders. Eradication techniques include the application of poisoned grains; fumigant rodenticide; gases (including aluminum phosphide, carbon monoxide, and methyl bromide) introduced into burrows through cartridges, pellets, and other methods; and combustible gas injected into burrow complexes and then ignited (Service 2014).
- The distribution of the California tiger salamander (Central California DPS) spans a considerable range in climatic conditions (including annual variation), and it is uncertain how the various sub-populations of the Central California tiger salamander might differ in their responses to climate change (Service 2014).

<u>*Five-Year Status Review*</u>

On October 21, 2014, the U.S. Fish and Wildlife Service completed a five-year status review of the Central population of the California tiger salamander and concluded that this species' threatened status would remain unchanged (Service 2014).

Critical Habitat

On August 23, 2005, the U.S. Fish and Wildlife Service (Service) designated critical habitat for the Central California population of the California tiger salamander pursuant to the Endangered Species Act of 1973, as amended (70 FR 49380). In total, approximately 199,109 acres (ac) (80,576 hectares (ha)) fall within the boundaries of the critical habitat designation. The critical habitat is located within 19 counties in California.

The critical habitat designation for *Ambystoma californiense* includes 31 units totaling 199,109 acres in four geographic regions in California. The four regions containing critical habitat are: (1) The Central Valley Region; (2) the Southern San Joaquin Valley Region; (3) the East Bay Region (including Santa Clara Valley area); and (4) the Central Coast Region.

The PCEs of critical habitat for the Central population of the California tiger salamander are the habitat components that provide:

(i) Standing bodies of fresh water (including natural and manmade (e.g., stock)) ponds, vernal pools, and other ephemeral or permanent water bodies which typically support inundation during winter rains and hold water for a minimum of 12 weeks in a year of average rainfall;
(ii) Upland habitats adjacent and accessible to and from breeding ponds that contain small mammal burrows or other underground habitat that CTS depend upon for food, shelter, and protection from the elements and predation; and
(iii) Accessible upland dispersal habitat between occupied locations that allow for movement between such sites.

Recovery Plan Information

On June 6, 2017, the Recovery Plan for the Central California DPS of the California tiger salamander was issued (Service 2017).

<u>*Recovery Actions*</u>

- Reduce Road Mortality: Coordinate with transportation agencies to incorporate wildlife tunnels in design plans for new roads and road improvement projects to decrease Central California tiger salamander road mortality (Service 2017).
- Reduce road mortality. Upgrade existing roads to include wildlife tunnels to decrease Central California tiger salamander road mortality (Service 2017).
- Reduce the risk of introduction of diseases (e.g., ranaviruses, chytrid fungi, or other pathogens) within preserves. Monitor breeding sites to detect disease outbreaks. Monitoring should be conducted during the breeding season to detect rapid die-offs of larvae, which may be the result of ranavirus, chytrid or other pathogens (Service 2017).
- Reduce the risk of introduction of diseases (e.g., ranaviruses, chytrid fungi, or other pathogens) within preserves. Determine the cause of die-offs. If a rapid die-off is detected, tests for ranaviruses, chytrid fungi, or other pathogens should be conducted immediately. Land managers should coordinate with the Service and CDFW to determine the appropriate next steps (Service 2017).
- Reduce the risk of introduction of diseases (e.g., ranaviruses, chytrid fungi, or other pathogens) within preserves. Develop contingency plans. Contingency plans should be incorporated into all management plans to ensure that a population infected with a ranavirus, chytrid fungus, or other pathogen is quickly isolated, and the disease does not spread to uncontaminated populations (Service 2017).
- Reduce the risk of introduction of diseases (e.g., ranaviruses, chytrid fungi, or other pathogens) within preserves. Develop measures to sterilize field equipment to minimize disease transmission (Service 2017).
- Reduce levels of non-native predator species within preserves. Reduce populations of non- native predators to a level where they are determined to not decrease Central California tiger salamander populations (Service 2017).
- Reduce levels of non-native predator species within preserves. Identify sites within each preserve that require non-native predator eradication or control. As a short-term method, physical removal of these non-native species may be most beneficial. However, proactive means of reducing the conditions in which these non-native species thrive is a long-term priority (see action 1.2.2 for a description of optimal breeding habitat to reduce non-native predators) (Service 2017).
- Reduce levels of non-native predator species within preserves. Prohibit introduction of fish species to breeding habitat or within any aquatic system that has the potential to convey non-native fish to breeding habitat (Service 2017).
- Develop and implement adaptive management and monitoring plans for protected habitat counted toward recovery. All preserves (as described in recovery criteria A/1 through A/4) should have management and monitoring plans. These plans should specifically target management and monitoring of Central California tiger salamander breeding and upland habitat to maintain habitat suitability in perpetuity. The plans may include, but are not limited to, actions to identify and reduce: harmful contaminants, non-native predator species, road mortality, and non-native tiger salamanders and hybrids. Management plans should describe grazing management and disease prevention strategies. Plans should be updated based on feedback from land managers and adaptive to climate change and other variables (Service 2017).

- Develop and implement adaptive management and monitoring plans for protected habitat counted toward recovery. Secure funding in perpetuity for habitat management and monitoring either through an endowment or other funding mechanism (Service 2017).
- Develop and implement adaptive management and monitoring plans for protected habitat counted toward recovery. Management plans should be developed to ensure high quality upland and breeding habitat is available for the Central California tiger salamander in perpetuity (Service 2017).
- Monitor trends to gain a better understanding of population health, trends in habitat loss, and other information that will help to guide conservation planning for the Central California tiger salamander.
    1. Establish and maintain a database that tracks the amount of incidental take authorized through section 7 and 10 of the Act.
    2. Monitor habitat land use change. Utilize GIS land use cover data to determine amount of suitable habitat that has been lost.
    3. Survey lands for Central California tiger salamander in areas that have not been well surveyed. The following management units have not been well surveyed: Dunnigan Hills, Central Valley West Side, Farmington, Oakdale/Waterford, Northeast Diablo Range, and Southeast Diablo. Other areas will likely require surveys as well.
    4. Conduct population viability analyses for Central California tiger salamander metapopulations throughout the range of the DPS. Population viability analyses are tools that can identify populations in need of recovery actions, as opposed to those that may be viable over the long-term without intervention.
    5. Research should be conducted to determine the effectiveness of standard avoidance and minimization measures (e.g., exclusion fencing, burrow excavation, and seasonal work windows) to ensure the most successful measures are being used during implementation of projects that may impact Central California tiger salamanders and their habitat.
    6. Conduct research on the effects of contaminants.
        - 6.1. Conduct investigations on effects of contaminants on Central California tiger salamander (or a surrogate salamander species if determined appropriate).
        - 6.2. Conduct research that determines which pesticides and other contaminants are commonly used on agriculture lands within the range of the Central California tiger salamander.
        - 6.3. Conduct research on the effects of mosquito abatement chemicals on Central California tiger salamander populations.
    7. Conduct genetic research.
        - 7.1. Monitor projects designed to increase native species genomes and limit hybridization. These studies should occur within a variety of geographic areas (e.g., Salinas Valley floor, foothill areas to the north and east of Salinas Valley, and Bay Area) to determine the most effective strategies in various geographic areas.
        - 7.2. Conduct focused research on SI alleles to determine how each non-native gene is physically expressed and the subsequent ecological impact of these genes.
        - 7.3. Conduct landscape genomic research and climate change modeling to identify genetic variability that may provide resiliency to climate change and identify areas of climate refugia.
    8. Conduct research on small burrowing mammal communities.
        - 8.1. Conduct research to determine burrow requirements for Central California tiger salamander populations (i.e., what burrow densities are optimal for Central California tiger salamanders, and how many small burrowing mammals are required to maintain these densities?).

    8.2. Conduct research to determine optimum grazing regimes to increase small mammal burrowing communities (Service 2017).

- Develop and implement participation plans for each Recovery Unit. Participation plans will assist in the realization of recovery goals by facilitating commitments from participating agencies and stakeholders to implement recovery actions, where feasible (Service 2017).

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California Tiger Salamander, Santa Barbara County DPS and its Critical Habitat

Listing Status

On September 21, 2000, the Service emergency listed the Santa Barbara County DPS of the California tiger salamander as endangered (65 Federal Register (FR) 3096). In 2004, the Service designated critical habitat for the Santa Barbara County DPS of the California tiger salamander (69 FR 68568). At the time of publication of the emergency listing rule in January 2000, the Santa Barbara County California tiger salamander was known from 14 ponds. The emergency and final listing rules acknowledged that other potential breeding ponds or pond complexes may exist but could not be surveyed at that time due to restricted access.

Life History and Habitat

Historically, the Santa Barbara County California tiger salamander inhabited low-elevation (below 475 meters (1,500 ft)) seasonal ponds and associated grassland, oak savannah, and coastal scrub plant communities of the Santa Maria, Los Alamos, and Santa Rita Valleys in the northwestern area of Santa Barbara County (Shaffer et al. 1993, p. 4). California tiger salamanders spend the majority of their lives in upland habitats and cannot persist without them (Trenham and Shaffer 2005, p. 1165). The upland component of California tiger salamander habitat consists of grassland savannah, but includes grasslands with scattered oak trees, and scrub or chaparral habitats (Shaffer et al. 1993, p. 4; 65 FR 3096). Juvenile and adult California tiger salamanders spend the dry summer and fall months of the year in the burrows of small mammals, such as California ground squirrels (*Otospermophilus beecheyi*) and Botta's pocket gopher (*Thomomys bottae*) (Loredo et al. 1996b, p. 283; Cook et al. 2006, p. 216). In general, studies show that adults can move 2 kilometers (1.2 miles) to more than 2.2 kilometers (1.4 miles) from breeding ponds (Trenham et al. 2001, p. 3526; Orloff 2011, p, 270).

Population Status

Currently, there are approximately 60 known extant California tiger salamander breeding ponds in Santa Barbara County (Service 2009, p. 9) distributed across the six metapopulations. Since listing, Service and CDFW developed guidance for protocol survey efforts (Service and Department 2003), and this guidance has aided in the detection of additional breeding ponds discovered post-listing. Several of the additional ponds were discovered as a result of surveys conducted as a part of proposed development or land conversion projects. The Santa Barbara County DPS of the California tiger salamander is threatened primarily by the destruction, degradation, and fragmentation of upland and aquatic habitats, primarily resulting from the conversion of these habitats by urban, commercial, and intensive agricultural activities (Service 2016). Additional threats to the species include hybridization with introduced nonnative barred tiger salamanders (*A. tigrinum mavortium*) (Service 2016, p. I-16), destructive rodent-control techniques (e.g., deep-ripping of burrow areas, use of fumigants) (Service 2016, p. I-10), reduced survival due to the presence of mosquitofish (*Gambusia affinis*) (Leyse and Lawlor 2000, p. 76), and mortality on roads due to vehicles (65 FR 3096).

Critical Habitat

A total of 4,523 hectares (11,180 acres) in six separate units are designated as critical habitat for the California tiger salamander in Santa Barbara County. Per the final critical habitat designation, the PCEs within the defined area that are essential to the conservation of the species include:

1. Standing bodies of fresh water, including natural and man-made (e.g., stock) ponds, vernal pools, and dune ponds, and other ephemeral or permanent water bodies that typically become inundated during winter rains and hold water for a sufficient length of time (i.e., 12 weeks) necessary for the species to complete the aquatic portion of its lifecycle;

2. Barrier-free uplands adjacent to breeding ponds that contain small mammal burrows. Small mammals are essential in creating the underground habitat that adult California tiger salamanders depend upon for food, shelter, and protection from the elements and predation; and
3. Upland areas between breeding locations (PCE 1) and areas with small mammal burrows (PCE 2) that allow for dispersal among such sites (69 FR 6858).

Recovery Plan Information

The goal of the recovery plan for the Santa Barbara County DPS of California tiger salamander (Service 2016) is to reduce the threats to the population to ensure its long-term viability in the wild and allow for its removal from the list of threatened and endangered species. The interim goal is to recover the population to the point that it can be downlisted from endangered to threatened status. The overall objectives of the recovery plan are to (1) protect and manage sufficient habitat within the metapopulation areas to support long-term viability of the Santa Barbara County DPS of the California tiger salamander and (2) reduce or remove other threats to the Santa Barbara County DPS of the California tiger salamander.

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California Tiger Salamander, Sonoma DPS and its Critical Habitat

Listing Status

The California tiger salamander, Sonoma DPS was emergency listed as endangered on July 22, 2002 (67 FR 47726), and was listed as endangered on March 19, 2003 (68 FR 13498). In 2011, the Service designated critical habitat for the Sonoma County DPS of the California tiger salamander (76 FR 54346).

Life History and Habitat

The historical range of the Sonoma County California tiger salamander included the Plain and Petaluma lowlands, an area approximating 100,000 acres. Prior to alteration of the Plain by humans, the landscape contained numerous vernal pools scattered across an area dominated by oak savannah, and representing a large, mostly continuous mosaic of suitable upland and aquatic habitat. By the mid-1990s, it was estimated that vernal pool habitat on the Plain had been reduced by more than 80 percent (Patterson et al. 1994). The current core range of Sonoma County California tiger salamander encompasses approximately 18,000-20,000 acres of fragmented habitat. This distribution has been curtailed primarily in two areas in recent times: the Santa Rosa Air Center area (southwest Santa Rosa) where observations have decreased since the early 1990s; and in the south Cotati area, where salamanders were once commonly observed in the late 1980s to early 1990s (D. Cook, in litt, 2009).

The Sonoma County California tiger salamander inhabits vernal pools and seasonal ponds, associated grassland, and oak savannah plant communities below 200 feet (60 meters) (Service 2003). Sonoma County California tiger salamanders spend the majority of their lives underground in small mammal burrows in uplands, while ephemeral ponds play a critical role because they are necessary for breeding.

Although historical breeding habitat for California tiger salamanders is natural vernal pools and ponds, they also use modified ephemeral or permanent ponds and manmade features such as constructed ponds or livestock ponds. This species is not known to breed in streams, rivers, or other flowing aquatic habitats (Cook et al. 2005). However, breeding individuals have been reported in roadside ditches in areas that contain seasonal wetlands. California tiger salamanders are sometimes found within permanent ponds; however, these occupied permanent ponds do not typically have predatory fish or breeding bullfrog populations (Fisher and Shaffer 1996).

Population Status

As described at the time of listing and in the recovery plan, virtually nothing is known about the historical abundance of the Sonoma County California tiger salamander (Service 2002; Service 2003; Service 2016). Its reclusive nature, longevity, and life history make it extremely difficult to estimate abundance. Individuals spend most of their lives underground and only a portion of the population migrate to ponds to breed every year. As mentioned in the recovery plan, the available data suggest that most extant populations consist of relatively small numbers of breeding adults—in the range of a few to a few dozen pairs—and populations that number above 100 breeding individuals are rare (CDFW 2010). Surveys continue to occur throughout the species' range and based on available survey information, Sonoma County California tiger salamander populations in the Alton Lane management area are the most robust.

Critical Habitat

Approximately 47,383 acres were designated as critical habitat. A single unit was designated as critical habitat for the salamander (Service 2011). The Santa Rosa Plain Unit is located in central Sonoma County and contains approximately 47,383 acres, which includes 745 acres of State lands, 744 acres of city lands, 498 acres of county lands, 9 acres of individually owned tribal trust land, and 45,387 acres of private lands. No Federal lands are within this unit. Per the final critical habitat designation, the PCEs within the defined area that are essential to the conservation of the species include:

- PCE 1: standing bodies of fresh water (including natural and manmade (e.g., stock) ponds, vernal pools, and other ephemeral or permanent water bodies that typically support inundation during winter/early spring and hold water for a minimum of 12 consecutive weeks in a year of average rainfall);
- PCE 2: upland habitats adjacent and accessible to and from breeding ponds that contain small mammal burrows or other underground refugia that salamanders depend upon for food, shelter, and protection from the elements and predation; and
- PCE 3: accessible upland dispersal habitat between occupied locations that allow for movement between such sites.

Recovery Plan Information

The Recovery Plan was finalized on May 31, 2016 (Service 2016). Because the main cause of the decline and the main current threat to the salamander is the loss and degradation of habitat, our recovery strategy focuses upon this threat. We will achieve recovery of these species by preserving high-quality habitat that provides essential connectivity, reduces fragmentation, and sufficiently buffers against encroaching development. Management of these preserved areas will provide additional protection to the habitat and address non-habitat related threats. Surveys and habitat assessments (where data are lacking) will be conducted, as will essential research that refines our knowledge on the recovery needs of the species. Additionally, habitat restoration (and potentially reintroductions) is necessary to provide additional populations to protect unique genetic diversity.

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Kern Canyon Slender Salamander

Listing Status

The Service proposed to list the Kern Canyon slender salamander as threatened (with a rule issued under section 4(d) of the Act) on October 18, 2022, and also proposed to designate approximately 2,051 acres of critical habitat for the species (Service, 2022a).

Life History and Habitat

The Kern Canyon slender salamander has a common slender salamander body with a narrow head and long and slim body, tail, and legs, measuring up to 2.2 inches, not including the tail. The coloration is dark brown along the sides and ventral surfaces with a flecked bronze and reddish pattern, with 20–21 costal grooves.

They are thought to have seasonally restricted surface activity, sheltering in underground burrows during unfavorable conditions. They have been found active on the surface from January to May in lower elevations, and from March to early November in higher elevations. When the salamanders are active on the surface in winter and early spring, they are typically nocturnal and are found primarily under cover objects such as rocks, logs, bark, and leaf litter in moist environments.

They are highly sedentary and have high site fidelity, thought to rarely venture more than 50 feet from the shelter of cover objects. They depend on skin and buccopharyngeal respiration (oxygen is taken up simply by diffusion or by the contraction and relaxation of the muscles of the cheeks or mouth and throat) and are therefore highly susceptible to water loss through their skin and desiccation.

Like other slender salamanders, their diet is likely composed of small invertebrates, earthworms, and slugs.

They deposit their eggs on land in cool, damp crevices or beneath surface objects that are within the margins of water sources. Reproduction occurs entirely on land and eggs hatch as miniature adults.

While the lifespan of the Kern Canyon slender salamander is unknown, the maximum age of the closely related species, the California slender salamander, is thought to be 8–10 years, reaching reproductive maturity after 2–4 years.

Given their reliance on water and cool and humid habitat, the greatest threats to the salamanders include the impacts of climate change, such as drought, and catastrophic wildfire.

Population Status

The Kern Canyon slender salamander is found in the southern Sierra Nevada along the south side of the Lower Kern River Canyon from Stark Creek to Erskine Creek, 1,480–5,500 feet above sea level, mostly within the Sequoia National Forest. At lower elevation, they occur within the Lower Kern River Canyon. At higher elevation they occur in Erskine and Bodfish Creeks, tributaries to the Kern River.

Recovery Plan Information

The Kern Canyon slender salamander is proposed for listing and therefore does not currently have a recovery plan in place.

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[Service] U.S. Fish and Wildlife Service. 2022a. Endangered and Threatened Wildlife and Plants; 12-Month Finding for the Kern Plateau Salamander; Threatened Species Status With Section 4(d) Rule for the Kern Canyon Slender Salamander and Endangered Species Status for the Relictual

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Relictual Slender Salamander

Listing Status

The Service proposed to list the relictual slender salamander as endangered on October 18, 2022, and also proposed to designate approximately 2,685 acres of critical habitat for the species (Service, 2022a).

Life History and Habitat

The relictual slender salamander belongs to the family Plethodontidae, known as the lungless salamanders. It is the smallest of all slender salamander species and is found in Sequoia National Forest of California in the Kern River Canyon. It is the smallest member of its genus, measuring up to two inches, not including the tail. Its body is relatively short and slender with moderately long limbs and 18-19 costal grooves. The coloration is blackish brown with a reddish, yellowish, or brown dorsal stripe.

The relictual slender salamander range is entirely within Sequoia National Forest and has the smallest range of any of the described species of slender salamander. They can be found under cover objects within moist microhabitat near seeps, perennial springs and small creeks in rocky areas with limited tree cover of oaks, pines, firs, buckeyes and sycamores.

Relictual slender salamanders are thought to have seasonally restricted surface activity, sheltering in underground burrows during unfavorable conditions. Members of the genus Batrachoseps do not usually excavate their own burrows. Instead, they rely on passages made by other animals, or cavities produced by root decay or soil shrinkage. At low elevations the salamanders are active on the surface during the winter and early spring, while at high elevations the salamanders are active in the late spring and summer. When the salamanders are active on the surface, they seek shelter under cover objects such as wood debris, leaf litter, or rocks. They are highly sedentary and have high site fidelity, thought to rarely venture more than 50 feet from the shelter of cover objects. They depend on skin and buccopharyngeal respiration and are therefore highly susceptible to water loss through their skin and desiccation.

Like other slender salamanders, their diet is likely composed of small invertebrates, earthworms, and slugs.

They deposit their eggs on land in cool, damp crevices that are within the margins of water sources. Reproduction occurs entirely on land and eggs hatch as miniature adults.

While the lifespans of the relictual slender salamander is unknown, the maximum age of the closely related species, the California slender salamander, is thought to be 8–10 years, reaching reproductive maturity after 2-4 years.

Given their reliance on water and cool and humid habitat, the greatest threats to the salamanders include the impacts of climate change, such as drought and catastrophic wildfire.

Population Status

The species is known historically from 13 sites: five sites on the south side of the Kern River in the Lower Kern River Canyon from 1,200–2,400 feet elevation, and eight sites on Breckenridge Mountain from 4,000–6,300 feet elevation. The range can be divided into three distinct geographic groups: the Lower Kern River Canyon Group, the Lucas Creek Group, and the Squirrel Meadow Group. The relictual slender salamander has not been found in the Lower Kern River Canyon since 1968. Surveys in the Lower Kern River Canyon conducted in the decade following construction of the highway concluded that the species had been extirpated from the Lower Kern River Canyon. The two extant geographic groups on Breckenridge Mountain are separated by less than 3.1 miles.

Recovery Plan Information

The relictual slender salamander is proposed for listing and therefore does not currently have a recovery plan in place.

Literature Cited

[Service] U.S. Fish and Wildlife Service. 2022a. Endangered and Threatened Wildlife and Plants; 12-Month Finding for the Kern Plateau Salamander; Threatened Species Status With Section 4(d) Rule for the Kern Canyon Slender Salamander and Endangered Species Status for the Relictual Slender Salamander; Designation of Critical Habitat. Proposed Rule; announcement of 12-month findings. Federal Register 87: 63150-63199.

[Service] U.S. Fish and Wildlife Service. 2022b. Species Status Assessment Report for the Relictual Slender Salamander (*Batrachoseps relictus*), Kern Canyon Slender Salamander (*Batrachoseps simatus*), and Kern Plateau Salamander (*Batrachoseps robustus*). U.S. Fish and Wildlife Service, Sacramento, California. August 2022. Available online at https://ecos.fws.gov/ServCat/DownloadFile/222488

Western Spadefoot, Northern DPS

Listing Status

The western spadefoot is currently under federal review for listing under the Act. On December 4, 2023, the Service proposed to list two distinct population segments of the western spadefoot as threatened, the northern distinct population segment and the southern distinct population segment (88 FR 84252). A species status assessment was issued in May 2023 (Service 2023a), compiling biological information and conditions on both distinct population segments.

Life History and Habitat

The western spadefoot ranges in size from 1.5 to 2.5 inches snout to vent length (Stebbins and McGinnis 2012, p. 156). They are dusky green or gray on their backs and often have four irregular light-colored stripes, with the central pair of stripes sometimes distinguished by a dark, hourglass-shaped area; furthermore, spadefoot have yellow eyes with vertical pupils. Adult western spadefoot forage on a variety of small invertebrate prey. Stomach content examinations have found food that includes grasshoppers, true bugs, moths, ground beetles, predaceous diving beetles, ladybird beetles, click beetles, flies, ants, and earthworms (Morey and Guinn 1992, p. 155). Food for western spadefoot larvae are unknown. However, the larvae of plains spadefoot (*Scaphiopus bombifrons*) consume planktonic organisms and algae, fairy shrimp, and will scavenge dead organisms, including other spadefoot larvae (Bragg 1962, p. 144; Bragg 1964, pp. 17–23).

Western spadefoots are primarily terrestrial and inhabit underground burrows. Western spadefoots typically burrow approximately 3 feet below ground during the dry season to avoid temperature extremes and desiccation (Stebbins and McGinnis 2012, p. 157). Western spadefoots emerge from their burrows to forage and breed following seasonal rains in winter and spring (Dimmitt and Ruibal 1980, p. 21; Jennings and Hayes 1994, p. 94). Emergence is likely related to a sound or vibration cue from the rain (Dimmitt and Ruibal 1980, p. 26). Most western spadefoot surface activity is nocturnal to reduce water loss. Little is known regarding the land surface types western spadefoot can traverse or the distances that western spadefoot may travel from aquatic resources for dispersal. A study looking at movement of western spadefoot individuals in an Orange County population found that the mean distance moved away from breeding pools was 131.36 feet (Baumberger 2013, p. 14), with the longest movement of an individual being 1,985 feet (Baumberger et al. 2020, p. 7).

Western spadefoot habitat is primarily open treeless grasslands, scrub, or mixed woodland and grassland where aquatic breeding habitat is available (Stebbins and McGinnis 2012, p. 157). Western spadefoot requires both aquatic and terrestrial habitat components in proximity to meet all life history requirements. Western spadefoots are primarily terrestrial and require upland habitats for feeding and for constructing burrows for long dry-season dormancy (Stebbins and McGinnis 2012, pp. 154–158).

Western spadefoots use aquatic habitat for breeding and developing larvae. Suitable aquatic habitat typically includes temporary vernal pools, sand or gravel washes, and small streams that are often seasonal (Stebbins and McGinnis 2012, p. 157). However, eggs and larvae of western spadefoot have been observed in a variety of permanent and temporary wetlands, both natural and altered, including rivers, creeks, artificial ponds, livestock ponds, sedimentation and flood control ponds, irrigation and roadside ditches, roadside puddles, tire ruts, and borrow pits, indicating a degree of ecological plasticity (Beever et al. 2016, p. 132; Nicotra et al. 2015, p. 1270). Although western spadefoot has been observed to inhabit and breed in wetlands altered or created by humans, survival and reproductive success in these pools have not been evaluated relative to that in unaltered natural pools. Temporary wetlands may be optimal aquatic breeding habitat due to reduced abundance of both native and nonnative predators, many of which require more permanent water sources (Jennings and Hayes 1994, p. 96; Stebbins and McGinnis 2012, p. 158).

Depending on temperature and annual rains, western spadefoot breeding, and oviposition occurs from January to May, most often in temporary pools and drainages from winter or spring rains (Stebbins 1985, p. 57). Age of sexual maturity is unknown but considering the relatively long period of subterranean dormancy (8 to 10 months), individuals may require at least 2 years to mature (Jennings and Hayes 1994, p. 94). Females deposit eggs in numerous, small, and irregular cylindrical clusters of 10 to 42 eggs, with an average of 24 eggs (Storer 1925, p. 157; Stebbins and McGinnis 2012, p. 156). Eggs range in size from 0.04 to 0.07 inches and are light olive-green or sooty on top and light colored on the bottom (Stebbins and McGinnis 2012, p. 156). Eggs hatch in 0.6 to 6 days depending on the temperature (Brown 1967, p. 747). Larval development can be completed in 3 to 11 weeks depending on food resources and temperature, and development must be completed before the pools dry (Burgess 1950, p. 49– 51; Feaver 1971, p. 53; Morey 1998, p. 86). Metamorphosing larvae may leave the water while their tails are still relatively long (0.4 inch) and move toward suitable terrestrial burrowing habitat (Storer 1925, p. 159).

Population Status

The historical range of the northern distinct population segment of the western spadefoot is entirely in California. It includes the area of the Sacramento and San Joaquin Valleys from Shasta to Kern Counties including the lower elevation foothill areas of the Sierra Nevada Mountains and low-elevation and valley areas in the northern Coast Range from Tehama County south to Santa Clara County. In the southwest portion of the northern distinct population segment's range, the occupied area extends from southern Santa Cruz County to southern Santa Barbara County of the Coast Range and is contiguous with the Central Valley portion of the distinct population segment’s range. (88 FR 84252). They have been found at sites from sea level up to 4,500 feet in the Sierra Nevada foothills (Stebbins and McGinnis 2012, p. 157).

The northern distinct population segment of the western spadefoot is thought to be extirpated throughout many historical locations within the Central Valley (Stebbins 1985, p. 67; Jennings and Hayes 1994, p. 96). In the northern western spadefoot range, the largest declines have been observed in the Sacramento Valley and San Joaquin Valley, while declines in abundance have been more modest in the Coast Ranges (Fisher and Shaffer 1996, p. 1387). A species distribution model for the northern western spadefoot range (north of Santa Barbara) found the areas predicted to have suitable habitat are patchily distributed along the foothills surrounding the Central Valley and in the southwestern quarter of the northern western spadefoot range including the Salinas Valley (Rose et al. 2020, entire).

Recovery Plan Information

No recovery plan exists for the western spadefoot; however, western spadefoots are threatened by urbanization, road construction, off-road vehicular traffic, illegal dumping, livestock grazing, and other edge effects that degrade habitat quality. In southern California, within the southern western spadefoot clade, over 80 percent of the habitat once known to be occupied by western spadefoot has been developed or converted to uses that are incompatible with successful reproduction and recruitment (Jennings and Hayes 1994, p. 96). Development can directly destroy aquatic breeding pools and underground burrows, or it can alter the hydrology such that aquatic breeding pools may not form where a population once existed. Furthermore, overabundant vegetation reduces the quality of aquatic breeding pools by causing them to dry more quickly, which then has impacts on reproduction and abundance. Anthropogenic warming increases the overall likelihood of extreme droughts in California into the future, and drought decreases the quality and quantity of aquatic breeding pools available for western spadefoot (Williams et al. 2015, pp. 6819, 6826).

Activities that produce low frequency noise and vibration, such as grading for development and seismic exploration for natural gas, in or near habitat for western spadefoot, may be detrimental to the species. Disturbances that cause western spadefoot to emerge at inappropriate times could result in mortality or reduced fitness (Dimmitt and Ruibal 1980, pp. 27–28).

Nonnative predators may be predating on western spadefoot. Furthermore, nonnative predators may compete with western spadefoot for prey and habitat (Morey and Guinn 1992, p. 153).

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Western Spadefoot, Southern DPS

Listing Status

The western spadefoot is currently under federal review for listing under the Act. On December 4, 2023, the Service proposed to list two distinct population segments of the western spadefoot as threatened, the northern distinct population segment and the southern distinct population segment (88 FR 84252). A species status assessment was issued in May 2023 (Service 2023a), compiling biological information and conditions on both distinct population segments.

Life History and Habitat

The western spadefoot ranges in size from 1.5 to 2.5 inches snout to vent length (Stebbins and McGinnis 2012, p. 156). They are dusky green or gray on their backs and often have four irregular light-colored stripes, with the central pair of stripes sometimes distinguished by a dark, hourglass-shaped area; furthermore, spadefoot have yellow eyes with vertical pupils. Adult western spadefoot forage on a variety of small invertebrate prey. Stomach content examinations have found food that includes grasshoppers, true bugs, moths, ground beetles, predaceous diving beetles, ladybird beetles, click beetles, flies, ants, and earthworms (Morey and Guinn 1992, p. 155). Food for western spadefoot larvae are unknown. However, the larvae of plains spadefoot (*Scaphiopus bombifrons*) consume planktonic organisms and algae, fairy shrimp, and will scavenge dead organisms, including other spadefoot larvae (Bragg 1962, p. 144; Bragg 1964, pp. 17–23).

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Western spadefoot habitat is primarily open treeless grasslands, scrub, or mixed woodland and grassland where aquatic breeding habitat is available (Stebbins and McGinnis 2012, p. 157). Western spadefoot requires both aquatic and terrestrial habitat components in proximity to meet all life history requirements. Western spadefoots are primarily terrestrial and require upland habitats for feeding and for constructing burrows for long dry-season dormancy (Stebbins and McGinnis 2012, pp. 154–158).

Western spadefoots use aquatic habitat for breeding and developing larvae. Suitable aquatic habitat typically includes temporary vernal pools, sand or gravel washes, and small streams that are often seasonal (Stebbins and McGinnis 2012, p. 157). However, eggs and larvae of western spadefoot have been observed in a variety of permanent and temporary wetlands, both natural and altered, including rivers, creeks, artificial ponds, livestock ponds, sedimentation and flood control ponds, irrigation and roadside ditches, roadside puddles, tire ruts, and borrow pits, indicating a degree of ecological plasticity (Beever et al. 2016, p. 132; Nicotra et al. 2015, p. 1270). Although western spadefoot has been observed to inhabit and breed in wetlands altered or created by humans, survival and reproductive success in these pools have not been evaluated relative to that in unaltered natural pools. Temporary wetlands may be optimal aquatic breeding habitat due to reduced abundance of both native and nonnative predators, many of which require more permanent water sources (Jennings and Hayes 1994, p. 96; Stebbins and McGinnis 2012, p. 158).

Depending on temperature and annual rains, western spadefoot breeding, and oviposition occurs from January to May, most often in temporary pools and drainages from winter or spring rains (Stebbins 1985, p. 57). Age of sexual maturity is unknown but considering the relatively long period of subterranean dormancy (8 to 10 months), individuals may require at least 2 years to mature (Jennings and Hayes 1994, p. 94). Females deposit eggs in numerous, small, and irregular cylindrical clusters of 10 to 42 eggs, with an average of 24 eggs (Storer 1925, p. 157; Stebbins and McGinnis 2012, p. 156). Eggs range in size from 0.04 to 0.07 inches and are light olive-green or sooty on top and light colored on the bottom (Stebbins and McGinnis 2012, p. 156). Eggs hatch in 0.6 to 6 days depending on the temperature (Brown 1967, p. 747). Larval development can be completed in 3 to 11 weeks depending on food resources and temperature, and development must be completed before the pools dry (Burgess 1950, p. 49– 51; Feaver 1971, p. 53; Morey 1998, p. 86). Metamorphosing larvae may leave the water while their tails are still relatively long (0.4 inch) and move toward suitable terrestrial burrowing habitat (Storer 1925, p. 159).

Population Status

The historical range of the southern distinct population segment of the western spadefoot includes portions of southern California and northwestern Baja California, Mexico (88 FR 84252). In California, the species occurred in valleys and low-lying areas of portions of the Coast Range from extreme southeastern Santa Barbara County south to Ventura, Los Angeles, San Bernardino, Orange, Riverside, and San Diego Counties. However, due to habitat loss and degradation, the species is now patchily distributed in southern California and mostly extirpated from the urbanized areas of Los Angeles and San Diego. Most remaining populations are isolated by habitat fragmentation resulting from land use conversion and urbanization (88 FR 84252).

Recovery Plan Information

No recovery plan exists for the western spadefoot; however, western spadefoots are threatened by urbanization, road construction, off-road vehicular traffic, illegal dumping, livestock grazing, and other edge effects that degrade habitat quality. In southern California, within the southern western spadefoot clade, over 80 percent of the habitat once known to be occupied by western spadefoot has been developed or converted to uses that are incompatible with successful reproduction and recruitment (Jennings and Hayes 1994, p. 96). Development can directly destroy aquatic breeding pools and underground burrows, or it can alter the hydrology such that aquatic breeding pools may not form where a population once existed. Furthermore, overabundant vegetation reduces the quality of aquatic breeding pools by causing them to dry more quickly, which then has impacts on reproduction and abundance. Anthropogenic warming increases the overall likelihood of extreme droughts in California into the future, and drought decreases the quality and quantity of aquatic breeding pools available for western spadefoot (Williams et al. 2015, pp. 6819, 6826).

Activities that produce low frequency noise and vibration, such as grading for development and seismic exploration for natural gas, in or near habitat for western spadefoot, may be detrimental to the species. Disturbances that cause western spadefoot to emerge at inappropriate times could result in mortality or reduced fitness (Dimmitt and Ruibal 1980, pp. 27–28).

Nonnative predators may be predating on western spadefoot. Furthermore, nonnative predators may compete with western spadefoot for prey and habitat (Morey and Guinn 1992, p. 153).

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Insects

Bay Checkerspot Butterfly and its Critical Habitat

Listing Status

This species was listed as threatened in September 1987 (52 FR 35366). The Service recommended uplisting to endangered in 2022 (USFWS 2022). Critical habitat was designated for Bay checkerspot butterfly on August 26, 2008 (73 FR 50406).

Life History and Habitat

The Bay checkerspot butterfly is a medium-sized butterfly and has brilliant markings in a mosaic of white, black and reddish-orange (USFWS 1998). Its forewings have black bands along the veins in the upper wing with bright reddish-orange, yellow and white spots (USFWS 1998). This butterfly was only found in Santa Clara County until recently when it was reintroduced to San Bruno Mountain and Edgewood County Park in San Mateo County, California (USFWS 2022). This species was listed as threatened in September 1987 (52 FR 35366). The Service recommended uplisting to endangered in 2022 (USFWS 2022).

The primary larval host plant for the butterfly is a small, annual, native dwarf plantain (*Plantago erecta*) (USFWS 1998). The butterfly also frequently requires the presence of a secondary host plant, either purple owl's-clover (*Castilleja densiflora*) or exserted paintbrush (*Castilleja exserta*) since owl's clover and the paintbrush remain edible longer than the plantain (USFWS 1998). At San Bruno Mountain, the butterfly also utilizes the nonnative English plantain (*Plantago lanceolata*) as a larval host plant which is more abundant and remains edible longer than the dwarf plantain (USFWS 2022). The Bay checkerspot butterfly requires areas with topographic diversity (warm south and west slopes as well as cool north and east slopes) because some slopes become unfavorable depending on annual weather conditions and time of year (USFWS 1998). The delayed senescence of host plants on cool, moist slopes allows larvae to reach their fourth instar (larval development stage or molt) and enter diapause (dormancy) before host plants become inedible (USFWS 1998). Larvae that are not able to enter diapause prior to host plant senescence starve and die (USFWS 1998). Warm temperatures in the spring accelerate the senescence of the host plants resulting in fewer larvae surviving to the adult phase (USFWS 2022).

Adult Bay checkerspot butterflies feed on the nectar of several plants found in association with serpentine grasslands, including California goldfields, tidy-tips, desert parsley, scytheleaf onion, sea muilla, false babystars, intermediate fiddleneck, and other species (USFWS 1998). The fecundity of the female butterflies is significantly affected by the availability of nectar (USFWS 1998).

The Bay checkerspot butterfly reaches sexual maturity each year and generally reproduces and dies within a single year (USFWS 1998). Adults emerge from pupae in early spring (late February to early May) and have an average life span of about 10 days with some individuals living over three weeks (USFWS 1998). Eggs are laid during the 4-to-6-week flight season near the base of the larval host plant and hatch within 10 days (USFWS 1998). Bay checkerspot caterpillars go through two different phases of feeding with a pause in between (USFWS 1998). The first is just after they hatch between March and May, where they will feed until they have molted three times. Larvae enter diapause and spend the summer in cracks and crevices or under rocks (USFWS 1998). Then after going dormant for the hot and dry months of summer and fall, they wake up sometime in November to February, and eat more until finally making their chrysalis in early spring (USFWS 1998). After mating, females lay 1 to 5 egg masses on the larval host plant containing anywhere from 5 to 250 eggs each (USFWS 1998). Eggs hatch in 13-15 days (USFWS 1998). The adult butterfly's average life span is about 10 days with some individuals living over three weeks (USFWS 1998).

At the time of listing, habitat damage resulting from urban development, highway construction, drought and overgrazing was noted as having caused the disappearance of four populations of Bay checkerspot butterfly (USFWS 1998). The threat from urban development has reduced over time as land protection has increased, and currently most of the butterfly's habitat is protected or expected to be protected under the Santa Clara Valley Habitat Conservation Plan/Natural Communities Conservation Plan (ICF International 2012, Santa Clara Valley Habitat Agency 2023). While overgrazing may still be a threat to Bay checkerspot butterflies, there is increasing consensus that grazing is the most cost effective and flexible tool for managing California grasslands (USFWS 2022). In fact, the local extirpation of the Bay checkerspot butterfly has occurred at sites after cattle grazing was removed (e.g., Tulare Hill) resulting in the displacement of larval host plants and nectar plants by non-native invasive annual grasses (USFWS 2022). The listing rule also noted climate change, habitat degradation and pesticide use as threats to the species (52 FR 35366). Today, wildfire and small population size coupled with pesticides, non-native invasive plant species, extreme weather and climate change threaten the species (USFWS 2022). The spread of non-native invasive plants is exacerbated by atmospheric nitrogen deposition from vehicle exhaust that fertilizes the naturally nutrient-limited serpentine soils allowing nonnative plants to invade and displace the butterfly's larval host plants and nectar plants (USFWS 2022).

The butterfly continues to be threatened by (USFWS 2022):

- Habitat degradation
- Non-native invasive plant species exacerbated by atmospheric nitrogen deposition from vehicle exhaust.
- Climate change
- Wildfire
- Fire retardant
- Pesticides
- Small populations

Population Status

Historically, the subspecies occurred in the vicinity of the San Francisco Bay area from San Bruno Mountain (west of the Bay), Mount Diablo (east of the Bay), to Coyote Reservoir (south of the Bay) (USFWS 1998). The current range of the subspecies is limited to Santa Clara and San Mateo counties, California and all occurrences are on serpentine or serpentine-like grasslands except for San Bruno Mountain where it occurs on non-serpentine nonnative annual grasslands (USFWS 2022). Since 2009, Bay checkerspot butterfly reintroductions or translocations continued in Santa Clara County at Tulare Hill and in San Mateo County at Edgewood Natural Preserve and San Bruno Mountain (USFWS 2022). The Edgewood and Tulare Hill reintroductions have had limited success, while the San Bruno Mountain reintroduction has the potential for success (USFWS 2022).

Critical Habitat

The critical habitat designation for the Bay checkerspot butterfly includes 12 units encompassing approximately 19,746 acres (73 FR 50406).

The primary constituent elements of critical habitat for Bay checkerspot butterfly are the habitat components that provide (73 FR 50406):

(i) The presence of annual or perennial grasslands with little to no overstory that provide north-south and east-west slopes with a tilt of more than 7 degrees for larval host plant survival during periods of atypical weather (for example, drought). Common grassland species include wild oats

(*Avena fatua*), soft chess (*Bromus hordeaceus*), California oatgrass (*Danthonia californica*), Italian ryegrass (*Lolium multiflorum*), purple needlegrass (*Nassella pulchra*), and Idaho fescue (*Festuca idahoensis*); less abundant in these grasslands are annual and perennial forbs such as filaree (*Erodium botrys*), true clovers (*Trifolium* species), and dwarf plantain (*Plantago erecta*). These species, with the exception of dwarf plantain, are not required by the Bay checkerspot butterfly, but merely are provided here as an example of species commonly found in California grasslands.

(ii) The presence of the primary larval host plant, dwarf plantain, and at least one of the secondary host plants, purple owl's-clover (*Castilleja densiflora*) or exserted paintbrush (*Castilleja exserta*), are required for reproduction, feeding, and larval development.

(iii) The presence of adult nectar sources for feeding. Common nectar sources include desert parsley (*Lomatium* species), California goldfields (*Lasthenia californica*), tidy-tips (*Layia platyglossa*), sea muilla (*Muilla maritima*), scytheleaf onion (*Allium falcifolium*), false babystars (*Linanthus androsaceus*), and intermediate fiddleneck (*Amsinckia intermedia*).

(iv) Soils derived from serpentinite ultramafic rock (Montara, Climara, Henneke, Hentine, and Obispo soil series) or similar soils (Inks, Candlestick, Los Gatos, Fagan, and Barnabe soil series) that provide areas with fewer aggressive, nonnative plant species for larval host plant and adult nectar plant survival and reproduction.

(v) The presence of stable holes and cracks in the soil, and surface rock outcrops that provide shelter for the larval stage of the Bay checkerspot butterfly during summer diapause.

Recovery Plan Information

On September 30, 1998, the Service issued the Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area (USFWS 1998) which includes the Bay checkerspot butterfly.

Recovery Actions

Recovery criteria for delisting this species include the following:

1. Core populations - Adult populations of at least 8,000 butterflies, or populations of at least 20,000 post-diapause larvae, in 12 of 15 consecutive years, at each of the following areas: Kirby, Metcalf, San Felipe, Silver Creek Hills, Santa Teresa Hills, and Edgewood Park. Total population across all core areas should be at least 100,000 adults or 300,000 post-diapause larvae in each of the 12 years, with no recent severe decline.

2. Satellite populations - Adult populations of at least 1,000 butterflies, or populations of at least 3,000 post-diapause larvae, in 10 of 15 consecutive years, at each of at least nine distinct areas: three in San Mateo County, five in Santa Clara County, and one in Contra Costa County. Adult populations of at least 300 butterflies, or populations of at least 1,000 postdiapause larvae, in 8 of 15 consecutive years, at each of at least 18 additional distinct areas: 5 in San Mateo County, 10 in Santa Clara County, 1 in Alameda County, and 2 in Contra Costa County. To be "distinct," populations should be separated by at least 1 kilometer (3,000 feet) of unsuitable, unrestorable habitat.

3. Protection and management of habitat - Permanent protection of adequate primary (core population), secondary (moderate-sized satellite), and tertiary habitat (small-sized satellite) to support long-term persistence of the metapopulations detailed under criteria 1 and 2 above. For satellite populations, because of their natural tendency to wink in and out of existence at various sites, this will mean protecting more habitat areas than the minimum 9 moderate-sized and 18 small-sized populations. It is estimated that nearly all known suitable habitats in San Mateo,

central and western Santa Clara, western Alameda, and Contra Costa Counties will be needed to support an adequate constellation of Bay checkerspot butterfly satellite populations. Appropriate adaptive management in perpetuity of the Bay checkerspot butterfly's native ecosystem should be guaranteed in all protected habitat, including secure funding for ongoing management.

4. Investigation and removal of existing or reasonably foreseeable threats to Bay checkerspot butterfly populations and habitat.

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Behren's Silverspot Butterfly

Listing Status

The Behren's silverspot butterfly was federally listed as an endangered species in 1997 (Service 1997). Out of concern for impacts from the collection of rare and endangered butterflies, and the subspecies' limited distribution, the Service did not designate critical habitat for the Behren's silverspot butterfly at the time of listing. The most recent status review of the species was issued in 2020 (Service 2020a).

Life History and Habitat

There is scant peer-reviewed published information for the Behren's silverspot butterfly. Thus, the best available information on life history of the Behren's silverspot is inferred from studies of another taxonomically-close coastal subspecies, the Oregon silverspot butterfly (Speyeria zerene hippolyta). This information is summarized in the recovery plan for the Behren's silverspot butterfly (Service 2015), and in the recovery plans for the Oregon silverspot butterfly and Myrtle's silverspot butterfly (S. z. myrtleae; Service 1998, 2001).

Studies of the Oregon silverspot found that females lay their eggs in the debris and dried stems of the larval food plant, the early blue violet (*Viola adunca*; McCorkle 1980; McCorkle and Hammond 1988). Other violets (*Viola* spp.) may be used as well, although Arnold (2006) suggested that *Viola adunca* is the sole larval food plant for the Behren's silverspot. Arnold based this conclusion on a review of botanical literature, herbarium records, a habitat assessment, and his observation of only this violet species at historical and all currently known Behren's sites. *Viola adunca* is a small, native, perennial herb with pale to deep violet flowers, which typically blooms in late spring to early summer. Leaves generally die back to the perennial rhizome during winter, re-sprouting in the early spring. Early blue violets have a widespread distribution in western North America, but within the Behren's silverspot range this violet species is associated with coastal grasslands.

Life history stages of the Behren's silverspot butterfly are described in the recovery plan (Service 2015) and summarized here. The species is univoltine, having a single brood per year. Eggs are laid in mid to late summer, and hatch soon after. As is typical for *Speyeria* (Scott 1986) Behren's females presumably oviposit (lay eggs) on or near early blue violets during the July to September period. Based on studies of the Oregon silverspot butterfly (Pickering *et al.* 1992; Service 2001; Damiani 2011), it is likely that Behren's females selectively oviposit in areas of higher violet density and lower vegetation height. Upon hatching, the caterpillars (larvae), which are dark-colored with many branching sharp spines on their back, eat the eggshell. The larvae then pass the fall and winter in diapause (a period of physical dormancy). Upon termination of diapause in the spring, the larvae immediately seek out the violet food plant. Based on an Oregon silverspot study, isolated violets are probably less likely to be used by caterpillars because they move relatively limited distances in search of food (Bierzychudek *et al*. 2009), and, as noted above, oviposition tends to be in areas of higher violet density. During the spring and early summer, they pass through six instars (stages of larval development) as they grow, before forming a pupa (a non-feeding stage between larva and adult) within a chamber of leaves that they draw together with silk. The adults emerge in about two weeks and live for approximately three weeks. Adult males likely emerge one to several weeks earlier than females, as in other *Speyeria* (Scott 1986; Service 2001).

In a given year, the timing of the period when adult butterflies are present (referred to as "flight period") will depend upon environmental conditions, but typically ranges from about mid-June to mid-September, with peak numbers around mid-July to mid-August, based on monitoring surveys conducted since 2006 (Service, unpubl. data 2020c; Arnold 2006). In the Point Arena area, adults have been observed as early as June 5 (Pratt 2004) and as late as September 27 (Service, unpubl. data 2020c).

Launer *et al.* (1992) suggested that overgrazing may have substantially reduced availability of nectar (particularly native plant species) and could have contributed to a decline of the closely-related Myrtle's silverspot butterfly (*Speyeria zerene myrtlae*). Inadequate nectar resources appear to be an ongoing problem for several Myrtle's populations (Service 1998). Butterflies without adequate nearby nectar plants may be forced to expend time and energy reserves searching for nectaring areas, reducing the number of fertilized eggs laid, at the same time exposing them to predation, winds, and road mortality (Service 1998).

Observations of adults feeding on nectar (referred to as "nectaring") are scant, but plant species used include thistles (*Cirsium* spp.), false dandelion (*Hypochaeris radicata*), and gumplant (*Grindelia stricta*). Biologists have also observed Behren's silverspot butterflies nectaring on bull thistle (*Cirsium vulgare*) and self-heal (*Prunella vulgaris*; Liebenberg 2011; Service 2012). There is more known about nectar sources for two other closely-related coastal subspecies, the Oregon and Myrtle silverspot butterflies (Service 1998, 2001, 2003, 2012). It is reasonable to assume that those nectar sources would also be used by the Behren's subspecies, when available. Nectar plants most frequently used by those subspecies include: members of the Asteraceae, including goldenrods (*Solidago* spp.), tansy ragwort (*Senecio jacobaea*), California aster (*Aster chilensis*), pearly everlasting (*Anaphalis margaritacea*), thistles *(Cirsium* spp., including *C. vulgare* and *C. arvense*), gumplant, seaside daisy (*Erigeron glaucus*), mule-ears (*Wyethia* sp.), and yarrow (*Achillea millefolium*). Reported nectar species from other plant families include: yellow sand verbena (*Abronia latifolia*), sea-pink (*Armeria maritima*) and western pennyroyal (*Monardella undulata*). Species used less frequently by Oregon silverspots include coyote bush (*Baccharis pilularis*), woolly sunflower (*Eriophyllum lanatum*), smooth hawksbeard (*Crepis capillaris*), and false dandelion (Service 1998, 2001, 2003, 2012). In 2022 and 2023, observations of Behren's silverspots nectaring on Pacific oeananthe (*Oenanthe sarmentosa*) were documented in multiple instances (Service, unpublished data).

Few data are available on reproduction of the Behren's silverspot butterfly. Captive rearing and augmentation efforts have provided some insight on this matter, but results are thus far observational and unanalyzed (Service, unpubl. data). More expansive examination has occurred for Oregon silverspot butterfly, and the following information is based primarily on those observations with some anecdotal corroboration for Behren's silverspot coming from the augmentation program. Males often emerge several weeks before females, and mating usually takes place in relatively sheltered areas (Service 2001). Female Oregon silverspot butterflies oviposit within or adjacent to areas with *Viola adunca*, and perhaps other violet species (Service 2003). Females appear to select areas with vegetation heights less than 10 inches; females did not search for oviposition sites in areas with taller vegetation (Singleton 1989 cited in Service 2001). Female Oregon silverspot butterflies captured in the wild and observed in the laboratory have laid up to 200 or more eggs (McCorkle 1980, and Arnold 1988). Under laboratory conditions, females of a related species, *Speyeria mormonia*, laid an average of 250 eggs during their lifetimes (Boggs and Ross 1993, cited in Service 1998); numbers laid in the wild may be less. In 2021, the captive rearing program at Sequoia Park Zoo collected 2,849 eggs from 7 females collected from the wild (Service, unpubl. report 2021). This averages 407 eggs per female. In 2022, the captive rearing program at Sequoia Park Zoo collected 2,571 eggs from 8 females collected from the wild (Service, unpubl. report 2022). This averages 321 eggs per female. However, these are under lab conditions where conditions are controlled, and nutrition is maximized. Number of eggs laid in the wild is likely lower due to increased pressures from predation, weather exposure, and stochastic events.

Behren's silverspot is a non-migratory butterfly. No quantitative data are available on the density, dispersal, or home range of these butterflies. Adults are believed to move distances of up to hundreds of yards, perhaps in response to nectar availability, or to escape foggy or windy conditions (Service 2001). Mark-recapture studies of Oregon silverspot have shown dispersal distances of over four miles (Service 2020b).

Habitat Use

The Behren's silverspot butterfly inhabits coastal terrace prairie habitat west of the Coast Range in southern Mendocino and northern Sonoma counties, California. Additionally, the species inhabits grasslands on a stabilized coastal dune system on Manchester State Park. Both of these habitats are strongly influenced by proximity to the ocean, with mild temperatures, moderate rainfall, and frequent summer fog. An occupied or potential site must have two key resources: (1) caterpillar host plants; and (2) adult nectar sources, as well as other suitable environmental conditions including wind breaks and warm microclimates. Distribution of the Behren's silverspot butterfly is highly dependent on these resources (Service 1997). Depending on the patchiness and spatial distribution of suitable habitat, a location may have a single butterfly population or several subpopulations that function as a metapopulation.

Within the coastal terrace prairie, violets (*Viola adunca*) need to be a component of the vegetative composition of the site, as they are the butterfly's larval host plant. Nectar sources need to be available to foraging adults during the summer flight period. In addition to availability of violets and nectar plants, a third habitat characteristic, cover in the form of shelter from wind, may also affect habitat suitability. The coastal prairies within the species' range are frequently windy during the butterfly flight season, with most strong winds from the northwest. Trees and large shrubs, as well as topographic features, can provide sheltered pockets, where microclimates are more favorable to butterfly flight and essential activities during windy periods. Shelter from coastal winds has been identified as important for coastal silverspot butterflies, including the Myrtle's (Service 1998), Oregon (Service 2001), and Behren's (Arnold 2006; Navratil 2013), but data is lacking on how the amount and configuration of shelter affect habitat quality.

Population Status

Statistically rigorous population estimates of Behren's silverspot have not been conducted. Rather, population indices have been collected since 2006 which are based on transect counts, efforts, and weather conditions. Population indices have ranged from 0 to 36 butterflies (Figure 1).

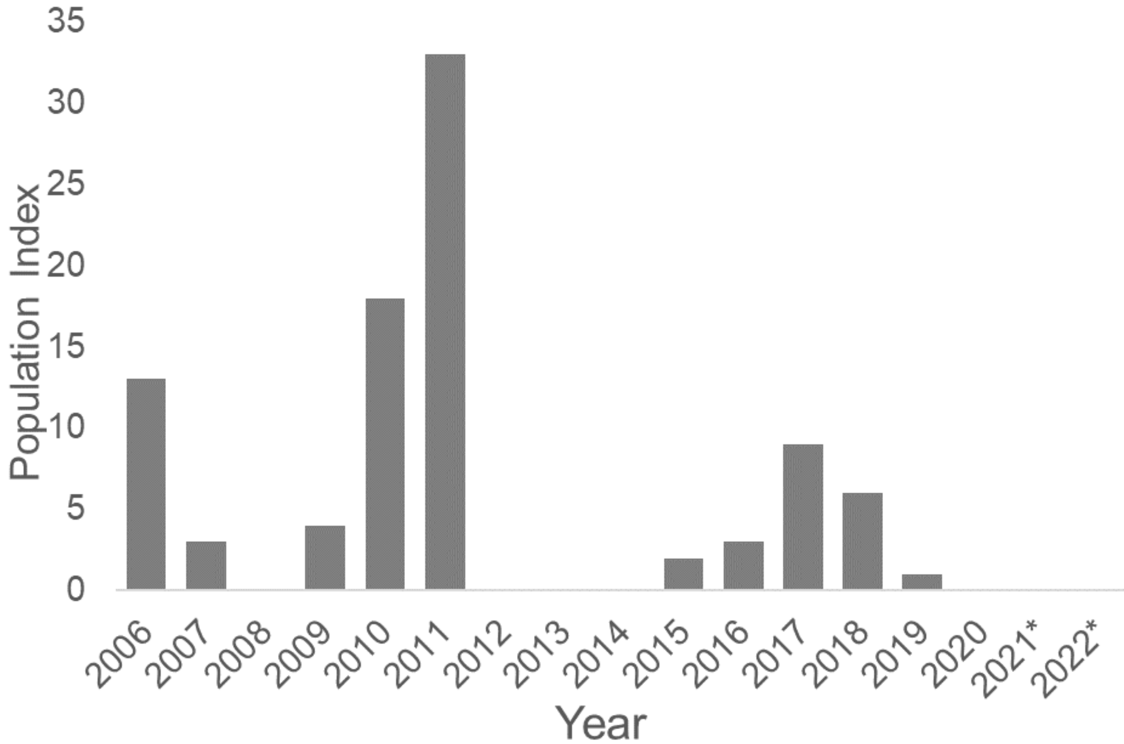

Figure 1. Behren's silverspot butterfly (*Speyeria zerene behrensii*) range wide population indices from 2006 to 2022. Years denoted with an asterisk (*) indicate that transect survey efforts were reallocated to finding existing populations, collections for captive rearing, and releases for augmentation.

The primary threats to the Behren's silverspot butterfly, cited at the time of listing, are over-collecting, and habitat destruction, fragmentation and degradation due to urban development, non-native plant invasion and competition, and excessive livestock grazing (Service 1997). Other factors include potential genetic problems associated with small populations, the lack of periodic fires which can maintain coastal prairie habitats, and the inadequacy of existing regulatory mechanisms (Service 1997).

While heavy grazing can denude vegetation and reduce habitat quality for the Behren's silverspot butterfly, light to moderate grazing may have a beneficial effect by reducing or reversing the effects of succession and by reducing the amount of thatch (Service 2003, 2012). Heavy growth of non-native grasses and other plants and accumulation of dead plant litter can result in overgrowth or shading of *Viola adunca* (Service 1998). Female Oregon silverspot butterflies appear to be attracted to areas of low vegetation and were more likely to lay eggs in areas with higher violet density (Service 1998; Damiani 2011).

Collision with vehicles (road-kill) is identified as a threat for the closely-related Oregon silverspot butterfly (Service 2001). The magnitude of road-kill as a threat to the Behren's silverspot is unknown, but road-kill is a potential threat, due to the proximity of occupied habitat to Highway 1, and other well-traveled public roads.

Captive Rearing and Augmentation

In 2021, the captive rearing program at Sequoia Park Zoo collected 2,849 eggs from 7 females collected from the wild (an average of 407 eggs per female). These hatched into 1,561 first instar larvae. Of these

110 individuals made it to pupation and 80 of those eclosed successfully into the habitat. In 2022, the captive rearing program at Sequoia Park Zoo collected 2,571 eggs from 8 females collected from the wild (an average of 321 eggs per female). These hatched into 1,439 first instar larvae. Results from the 2023 releases are still being analyzed. Notably, these results are from lab environments where conditions are controlled, and nutrition is maximized. Thus, it is likely that numbers of eggs laid and larval survival would be less in the wild.

Recovery Plan Information

The final recovery plan for Behren's silverspot butterfly was published in 2015 (Service 2015). Conservation needs of the Behren's silverspot butterfly are best summarized by downlisting and recovery objectives for the species in the final recovery plan. The delisting criteria are: (1) metapopulations have been established at six protected locations; two in Sonoma County and four in Mendocino County; (2) the six metapopulations are protected and managed in perpetuity for the Behren's silverspot butterfly and threats are sufficiently controlled or ameliorated through the active implementation of management plans; and (3) each of the six protected metapopulations supports a minimum viable population of 1,000 butterflies for at least 10 years, with each metapopulation reflecting an increasing population trend over the 10-year period, and a range-wide population of at least 6,000 during that period.

The downlisting criteria are: (1) three metapopulations in Mendocino County and one metapopulation in Sonoma County occupy (currently known, discovered, or reintroduced) sites that reflect historical distribution (four metapopulations represents the historical distribution); (2) all metapopulations are protected in perpetuity; (3) Adequate funding for management of all four sites is assured and Service-approved adaptive management plans that control threats to the habitat such as succession, exotic vegetation and livestock grazing, have been developed and are being implemented; and (4) Annual monitoring has shown that the range-wide population cumulatively supports a minimum of 4,000 adults for at least 10 consecutive years, with no individual protected metapopulation having fewer than 1,000 adults in any year. Each metapopulation needs to reflect a stable or increasing population trend over the 10-year period.

The conservation strategy described in the recovery plan includes five key priority actions: (1) protect habitat for the Behren's silverspot butterfly; (2) determine ecological requirements, population constraints, and management needs of the Behren's silverspot butterfly; (3) monitor the Behren's silverspot butterfly's status and habitat; (4) reduce take; and (5) undertake public information and outreach programs. In addition, augmentation may be warranted to maintain existing metapopulations, as may be reintroduction to establish new metapopulations in areas of existing suitable and/or restored habitat within the historic range. Finally, the recovery strategy calls for management and monitoring of protected habitats to deal with continuing and persistent threats.

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Callippe Silverspot Butterfly

Listing Status

This species was listed as endangered on December 5, 1997 (62 FR 64306).

Life History and Habitat

The callippe silverspot butterfly is a medium sized butterfly with a wingspan of approximately 2.2 inches (USFWS 2020). The upper wings are brown with extensive black spots and lines. The undersides of the wings are brown, orange-brown and tan with black lines and distinctive black and bright silver spots. The inner areas of the wings and body are covered with dense hair (USFWS 2020).

The callippe silverspot butterfly occurs in grasslands with California golden violet (*Viola pedunculata*), which is its sole larval host plant (USFWS 2020). Currently, there is no known method for successfully propagating and outplanting its larval host plant in restoration projects. Preferred nectar sources for adult callippe silverspot butterflies include both native (Alameda coyote thistle, coyote wildmint, California buckeye) and non-native plants (nonnative thistles, blessed milk thistle) (USFWS 2020). At the King/Swett Ranch in the Cordelia Hills, callippe silverspot butterflies were found to travel up to 1 mile to nectar from the native California buckeye (Arnold, 2007). Having diverse nectar sources available ensures that nectar is available throughout the flight season (typically mid-May to late July), which may be particularly important during years with early or late emergence (USFWS 2020).

Adult females lay their eggs during the early summer on the ground under leaf litter near the base of the larval host plant (USFWS 2020). A single female silverspot butterfly may lay as many as 600 eggs. Larvae hatch from the eggs in about a week. After hatching, larvae eat the lining of the eggshell, take shelter in ground litter, and then enter diapause, a period of reduced activity and development. Most callippe silverspot butterfly larvae remain in diapause from early summer until the following spring. After diapause, the larvae eat the foliage of their larval host plant and go through five metamorphoses before developing into a pupa. The pupal stage of the callippe silverspot butterfly lasts about 2 weeks. After transforming into a butterfly, the adult males live an average of 4.9 days and adult females live an average of 7.3 days. The average adult flight season is from mid-May to late July with a few adults observed in April and early August. Adult callippe silverspot butterflies congregate at hill tops to find mates (hilltopping behavior). The butterfly's average life span is 4.9 days for adult males and 7.3 days for adult females but can live up to 14 days (USFWS 2020).

The butterfly continues to be threatened by (USFSWS 2020):

- Habitat degradation and fragmentation
- Climate change
- Illegal collection
- Habitat modification by non-native invasive plant species exacerbated by atmospheric nitrogen deposition from vehicle exhaust
- Habitat modification by encroachment of native shrubs (succession to coastal scrub) exacerbated by fire suppression
- Pesticides
- Small populations
- Wildfire
- Inability to restore larval host plants if removed
- Trampling of larvae and host plants by hikers along trails

Population Status

Since 1988, callippe silverspot butterflies have been recorded at San Bruno Mountain and Sign Hill near South San Francisco (San Mateo County, California), at Sears Point (Sonoma County, California), and in the hills between Vallejo and Cordelia (Solano County, California) (USFWS 2020). The historical range also included populations in San Francisco County (e.g., Twin Peaks) and Joaquin Miller Park in Alameda County, which are now extirpated (USFWS 2020). The callippe silverspot butterfly was thought to still occur in Alameda and Contra Costa counties until recent genetic studies determined that the butterflies there are the non-listed Comstock's silverspot butterfly (Hill 2018).

Recovery Plan Information

There is no recovery plan for the callippe silverspot butterfly.

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Casey's June Beetle

Listing Status

On September 22, 2011, the Service listed Casey's June beetle as a federally endangered species due to threats posed by the development of its habitat, and habitat fragmentation and degradation (76 FR 58954). Critical habitat was designated in the same rule.

Life History and Habitat

Casey's June beetles are medium-sized June beetles, usually 0.56 to 0.70 inch in length (Evans and Hogue 2006), dusty brown or whitish in color with the appearance of brown and whitish longitudinal stripes on the elytra (Blaisedell 1930, Bruyea 2006). Most of the body has a covering of whitish scales, supplemented on much of the head, thorax, and ventral surfaces with fine, white hairs. Their reddish-brown antennae are clubbed, as is common to scarab beetles. The clubbed ends consist of a series of leaf-like plates that can be held together or fanned out to detect scents. Females display an accentuated sexual dimorphism, which is characterized by an enlarged abdomen, reduced legs and antennae, and metathoracic wing reduction (reduction in flight wing size in adults).

Casey's June beetle adults emerge from underground to mate above-ground from March through June, with above-ground abundance peaks generally occurring in April and May (Gregory and Ronan 2017, unpublished data). Casey's June beetle emergence holes can be observed most readily in areas of hardpan (wet soil that has washed and hardened over sand) or hard packed, consolidated soils. Females are seen more rarely than males, have always been reported on the ground, and are considered flightless (Hovore 1995, Hovore 2003). It is unknown how far females can disperse, or if they may disperse by other means than terrestrial crawling. Flightless adult female June beetles are not likely to be dispersed by the wind or other animals. It is likely adult or larval females are occasionally moved downstream by stream flows in wash areas, although it is unclear what their survival rate is under such circumstances.

The larval cycle for the species is likely completed in 1 year, based on the absence of larvae in burrows observed during the adult flight season (La Rue 2004, pers. comm.). However, observation of Casey's June beetle larvae maintained in controlled captive conditions did not molt during the breeding season, suggesting the possibility of a larval lifespan greater than 1 year (Osborne 2022, pers. comm.). The food source for Casey's June beetle larvae while underground is unknown, but other species of June beetles are known to eat "plant roots or plant detritus and associated decaying organisms" (Hovore 2003). Under laboratory conditions, Casey's June beetle larvae were found to feed on detritus and rotten wood (Osborne 2020, unpublished data, Osborne 2022, unpublished data).

Population Status

We consider all known occurrences of Casey's June beetle to constitute a single population based on genetic analysis (Rubinoff et al. 2020) and other currently available data. Casey's June beetle population status is currently represented by a small population that has exhibited a significant decline in its available habitat and a substantially reduced distribution. Recent empirical data is available and analysis pending to determine the estimated rate of population change over a five-year period for Casey's June beetle (Gregory and Ronan 2016–2020, unpublished data). The closely related rate of loss of available habitat over the last several decades represents a correlated indicator of population change for Casey's June beetle over a longer time scale. Population size has likely been declining, concomitant with the loss of habitat to development.

Recovery Plan Information

The species does not yet have a recovery plan.

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Delhi Sands Flower-Loving Fly

Listing Status

The Delhi Sands flower-loving fly (DSF) was listed as endangered on September 22, 1993 (Service 1993), and a recovery plan was completed for the subspecies in 1997 and an addendum was completed in 2019 (Service 1997, 2019). We completed a 5-year review of the status of DSF in 2008 and 2021 (Service 2008, 2021). The 5-year review recommended no change in the listing status of DSF. Please see the 5-year review for more specific information on the subspecies description, habitat affinities, life history, status and distribution, threats, and conservation needs of SBKR across its current range. The 5-year review and the recovery plan are available at: https://ecos.fws.gov/ecp/species/1540.

Life History and Habitat

The DSF key habitat feature are areas containing unconsolidated Delhi fine sand soil type, which is composed of windblown (aeolian) sandy soils. The areas covered by these Delhi soils make up the Colton Dunes system, which historically covered an estimated 88 square kilometers (40 square miles) within southwestern San Bernardino and northwestern Riverside counties (Woodruff 1980).

The dominant physical characteristic of the Colton Dunes ecosystem is a series of dynamic windblown dunes, subject to repeated ground surface changes during periodic, seasonal high winds. “Santa Ana” winds normally occur during autumn and winter, and facilitate transportation and maintenance of sand and provide periodic endogenous disturbance (i.e., a natural internal function of the ecosystem). The system has been exposed repeatedly to this type of disturbance through evolutionary time (Mcintyre and Hobbs 1999). The endogenous disturbance of the dune system by high winds may be an essential component of ecosystem function for the DSF but this remains unverified.

Plants associated with the DSF include California buckwheat (Eriogonum fasciculatum), telegraph weed (Heterotheca grandifolia), and California croton (Croton californicus). Suitable habitat ideally contains only sparse vegetative cover, usually less than 40 percent. The Colton Dunes also support a number of other rare plants and animals, including the legless lizard (*Anniella stebbinsi*), San Diego horned lizard (*Phrynosoma coronatum blainvillii*), Delhi Sands metalmark butterfly (*Apodemia mormo nigrescens*), Delhi Sands Jerusalem cricket (*Stenopelmatus* undescribed species), convergent apiocerid fly (*Apiocera convergens*), and the potentially extinct Pringle’s monardella (*Monardella pringlei*). The Delhi Sands metalmark butterfly was recently described from the area (Emmel and Emmel 1998).

In recent years DSF had been observed in vegetation denuded sites in areas where the species had been though extirpated (Service 2021), therefore, Dehli sands continue to be the main indicator of potential habitat (Service 2022).

Since listing, habitat loss has been the primary threat to DSF recovery. Efforts have been made to conserve habitat in the three Recovery Units (RU) (Ontario RU, Jurupa RU, and Colton RU), there are several parcels currently conserved for the DSF in the three RUs (Service 2019), but much of the remaining potential and suitable habitat is in small, fragmented parcels. Most of this habitat is not actively managed to maintain or increase the overall abundance of DSF. To be self-sustaining, each population will need to be able to move among and recolonize suitable isolated habitat patches. This would minimize impacts from inbreeding, maintain genetic diversity, and increase population size of the DSF.

DSF populations were thought to be extirpated from the Ontario RU, however several individuals were observed near a conserved parcel (Powell 2018a). In order to preserve the Ontario RU surveys should be used to determine if all conserved land parcels, in conjunction with additional management and conservation, could support a functional population along with adding more potential habitat to conservation.

Small parcels that act as “stepping stones” link core areas for dispersal, therefore protection of remaining habitat is essential habitat to the recovery DSF functional populations. Methods should be explored to restore/enhance habitat to reclaim former and degraded habitat. Assess population(s) within conserved habitat and independent survey data on privately owned parcels to determine where and estimate how many DSF occupied areas remain.

The Colton Recovery Unit remains important to the conservation and recovery of the DSF because the area contains the largest remaining contiguous block of DSF habitat (the Bank and adjacent habitat) and contains the greatest number of extant populations of DSF. Areas of 200 or more adult flies are considered necessary for recovery of the species (Service 2021, 2022). Conservation of the remaining unprotected populations within the full range of Dehli sands along with completion of the Bank will help achieve the needed habitat preservation identified in the recovery plan and 5-year review for this subspecies.

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Mission Blue Butterfly

Listing Status

This species was listed as endangered in June 1976 (41 FR 22041).

Life History and Habitat

The mission blue butterfly is a small, mostly blue (male) or brown (female) butterfly that flies from March to early July (USFWS 1984). It is associated with three species of lupine which primarily serve as the larval food plants: silver lupine (*Lupinus albifrons*), summer lupine (*L. formosus*) and many-colored lupine (*L. varicolor*) (USFWS 1984). The mission blue butterfly can be found in coastal scrublands and grasslands that contain at least one of these lupine species in southern Marin, San Francisco, and San Mateo counties in California (USFWS 2019).

Mission blue butterflies inhabit coastal prairie grasslands which are also inhabited by one of its host lupine species (USFWS 1984). The mission blue butterfly's host lupines are dependent on disturbances to the land like rodent burrows, rockslides and fires to establish as seedlings (USFWS 1984).

The mission blue butterfly has a wingspan of 2.5 to 3.6 centimeters (USFWS 1984). In males, the upper side of the wings is iridescent blue with a black border fringed with white hair-like scales. In females, the upper surface of the wings is dark brown, marked with blue basal areas, with a border similar to the male. In males and females, the underside of the wings is pale grey with two rows of irregular white-ringed black spots. The caterpillars are mostly green, and the body is covered with short white hairs (USFWS 1984).

Mission blue butterfly caterpillars exclusively feed on lupines, primarily silver lupine, many-colored lupine, and summer lupine (USFWS 1984). Adults feed on a variety of nectar flowers among and near lupine patches (USFWS 1984).

The mission blue butterfly has one new generation a year (USFWS 1984). Adults fly during the day from March to early July and reproduce among patches of lupines that serve as the larval host plant (USFWS 1984). Adults travel usually less than 600 meters but up to 2,500 meters from their lupine host plants (USFWS 2019). Males fly about or perch on or near the lupines and fly out to encounter passing objects to meet receptive females (USFWS 1984). Females usually lay their eggs on the tops of lupine leaves, preferring new growth. They may lay their eggs on lupine stems, flowers or seedpods (USFWS 1984).

Eggs can take seven to 32 days to hatch depending on environmental conditions (USFWS 1984). About three weeks after the larvae hatch, they go dormant in the leaf litter near their host plants until the following spring, after which they awake and continue feeding. The developing larvae have a mutualistic relationship with native ants that defend the larvae from predation and parasitism in return for honeydew secreted by the larvae (USFWS 1984). However, this mutualistic relationship with native ants may be disrupted by the presence of non-native Argentine ants resulting in increasing rates of predation and parasitism of larvae (USFWS 2019). Caterpillars pupate on or near the base of lupine plants for about three weeks before emerging as mature butterflies (USFWS 1984).

After becoming adult butterflies, males live approximately seven days and females approximately eight days (USFWS 1984).

The butterfly continues to be threatened by (USFWS 2019):

- Habitat degradation via encroachment of coastal chaparral, coastal scrub succession, non-native grasses, and associated thatch build-up

- Climate change
- Encroachment of native shrubs (succession to coastal scrub) exacerbated by fire suppression
- Habitat modification by non-native invasive plant species exacerbated by atmospheric nitrogen deposition from vehicle exhaust
- Fungal pathogens (*Colletotrichum lupini*) killing larval host plants (primarily silver lupine)
- Vole herbivory of larval host plants
- Hobby collection
- Small populations
- Parasitism and predation of larvae potentially exacerbated by non-native Argentine ants
- Larvae and host plants being runover on dirt roads
- Trampling of larvae and host plants by hikers along trails

Population Status

The mission blue butterfly is a small, mostly blue (male) or brown (female) butterfly that flies from March to early July. It is associated with three species of lupine, which primarily serve as the larval food plants: silver lupine, summer lupine, and many-colored lupine (USFWS 1984). The mission blue butterfly can be found in coastal scrublands and grasslands that contain at least one of these lupine species in southern Marin, San Francisco, and San Mateo counties in California (USFWS 2019).

Recovery Plan Information

On October 10, 1984, the Service issued the Recovery Plan for the San Bruno Elfin and Mission Blue Butterflies which was later amended in 2019 (USFWS 1984; 2019).

Recovery Actions

Recovery criteria for downlisting this species (USFWS 1998) include the following:

1. Sites supporting metapopulations of the mission blue butterfly (see criterion number 4 below) must be managed to ensure the maintenance of habitat that includes host plants and a diversity of nectar plants. Sites shall have in place a management plan approved by the U.S. Fish and Wildlife Service that supports grasslands and controls other threat to the species and its habitat. Long-term maintenance of the sites must be financially sustainable. Management tools including herbicides, mowing, burning, or livestock grazing should be implemented with appropriate methods and timing to avoid impacts to the butterfly and its nectar and host plants.

2. Monitoring must determine that all mission blue butterfly metapopulation sites support populations of both silver and summer lupine (Lupinus albifrons and L. formosus), including a variety of size and/or age classes. In some localities, habitat and/or microclimate is not appropriate for both of these species, and the presence of alternate lupine species may be more appropriate, as determined by property managers. Monitoring over a 15-year period, which includes at least two years that have above average local spring rainfall, must demonstrate natural recruitment of both lupine species and an average of 250 lupine plants/hectare. Mission blue butterflies must be documented using both species of lupine.

3. Suitable habitat has a minimum of 250 nectar plants/hectare.

4. Metapopulations are maintained or re-established in suitable habitat within the historical range of the species, including at least one metapopulation each in Marin, San Francisco, and San Mateo Counties. The San Mateo County metapopulation must be maintained on San Bruno Mountain

contain populations across Guadalupe Hills, Southeast Ridge, Radio Ridge, and Reservoir Hill. The metapopulation in Marin County must contain at least three populations.

5. Patches of suitable habitat must be at least 6 hectares (15 acres) to support each of the populations designated in criterion number 4. Patches of occupied suitable habitat of this size that are contiguous to each other may also satisfy the numerical target for number of populations as defined in criterion number 4 for metapopulations in Marin and San Francisco Counties (but see specific location requirements for San Bruno Mountain). Component habitat features (e.g., host plants, nectar plants) within each patch of suitable habitat must be free of barriers to movement between them. Suitable habitat patches must have stable or increasing grassland acreage over at least a 25-year period, with management focused on maintaining larger habitat patches. For each site, woody vegetation should make up no more than 15 percent of the absolute vegetative cover at the metapopulation level. 16 San Bruno Mountain must have a minimum of 1200 acres of grassland as designated in the Habitat Management Plan (TRA Environmental Sciences 2007).

6. Population viability analysis determines that mission blue butterflies have a 90% probability of persistence over a 25-year period across all three counties of the historic range as referred to in criterion number 4. Probability of persistence may be based on varying numbers of metapopulations or populations within each county.

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Monarch Butterfly

Listing Status

The Service determined that the listing of the monarch butterfly (*Danaus plexippus*) was warranted but precluded by higher priority listing actions on December 15, 2020 (Service 2020a). As a candidate species, the monarch butterfly's listing status will be reconsidered in 2024, or earlier if warranted. The Service completed a Species Status Assessment (SSA) for the monarch butterfly as part of its evaluation on September 1, 2020 (Service 2020b).

Life History and Habitat

The monarch butterfly is a species in the order Lepidoptera (family Nymphalidae). Adult monarchs are large and conspicuous, with bright orange wings surrounded by a black border and overlayed by black veins. The black border has a double row of white spots, present on the upper side and lower side of forewings and hindwings (Bouseman and Sternberg 2001, p. 222). Adult monarchs are sexually dimorphic, with males having narrowing wing venation and scent patches (Secretariat of the Commission for Environmental Cooperation (CEC) 2008). Larvae of the monarch butterfly are easily recognized by their vertical stripes of black, white, and yellow-green. The bright coloring of a monarch serves as a warning to predators that they contain toxic compounds called cardenolides, derived from their host plant, and are distasteful to eat. A fully grown caterpillar pupates into a pale green, gold-spotted chrysalis, in which the monarch forms their adult form.

The monarch butterfly is a species that is globally distributed throughout 90 countries, islands, and island groups, including within North, Central, and South America; Australia; New Zealand; islands of the Pacific and Caribbean; and elsewhere (Malcolm and Zalucki 1993, p. 3-5). Both monarchs and milkweed likely dispersed from North America via human assistance, potentially aided through wind dispersal events (Brower 1995, p. 354). After careful examination of the literature and consultation with experts, there is no clearly agreed upon definition of potential subspecies of *Danaus plexippus* or where the geographic borders between these subspecies might exist. Given these findings, the Service assumed in the SSA that monarchs in locations outside of North America have become naturalized, and thus, these records, along with the North American occurrences, comprise the historical range of the species.

Life History and Resource Needs

Monarchs lay their eggs on their obligate milkweed host plant (primarily *Asclepias* ssp. in North America; *Asclepias* spp., *Gomphocarpus* spp., and *Calotropis* spp. outside of North America) during the breeding season and larvae emerge after 2 to 5 days (Zalucki 1982, p. 242; CEC 2008, p. 12; Blakley and Dingle 1978, p. 134; Buden and Miller 2003, p. 4). The larvae develop through five larval instars (intervals between molts) over a period of 9 to 18 days, feeding on milkweed and sequestering cardenolides as a defense against predators (Parsons 1965, p. 299). The larva then pupates into a chrysalis before emerging 6 to 14 days later as an adult butterfly.

The monarch life cycle varies by geographic location. Due to the year-round presence of milkweed and suitable temperatures, many of the global monarch populations breed year-round and repeat the above-referenced life cycle throughout the year. Individual monarchs in temperate climates, such as eastern and western North America, produce multiple generations of monarchs during the summer breeding season, with most adult butterflies living approximately 2 to 5 weeks. In the fall, North American monarchs undergo long-distance migration to their overwintering sites, where the migratory generation of adults suspends reproduction and lives for 6 to 9 months (Cockrell et al. 1993, pp. 245-246; Herman and Tartar 2001, p. 2509). Surviving monarchs mate at the overwintering sites before dispersing in mid-winter to early spring (January-March) (Leong et al. 1995, p. 46; van Hook 1996, pp. 16-17). In early spring

(February-March), surviving monarchs break diapause and mate at the overwintering sites before dispersing (Leong et al. 1995, p. 46, van Hook 1996, pp. 16-17). The same individuals that undertook the initial southward migration begin flying back through the breeding grounds and their offspring start the cycle of generational migration over again (Malcolm et al. 1993, p. 262).

Migratory individuals in eastern North America predominantly fly south or southwest to mountainous overwintering grounds in central Mexico, resulting in monarchs traveling distances of over 1,864 miles for over 2 months (Urquhart and Urquhart 1978, p. 1760; Brower 1996, p. 93). Monarchs seek refuge in a variety of roosting trees along the fall migration route. Migratory individuals in western North America generally fly shorter distances south and west to overwintering groves along the California coast into northern Baja California (Solensky 2004, p. 79). Data from monarchs tagged in the southwestern states in the fall suggest that those in Nevada migrate to California, those in New Mexico migrate to Mexico, and those in Arizona migrate to either Mexico or California (Southwest Monarch Study Inc. 2018).

Vegetation Structure

Adult monarch butterflies in many of the global populations do not migrate, due to the presence of milkweed and suitable temperature, and need nectar and milkweed resources year-round. Adult monarch butterflies in eastern and western North America, require a diversity of blooming nectar resources to feed on throughout their migration routes and breeding grounds (spring through fall). Monarchs also need milkweed, for both oviposition and larval feeding, throughout this diverse nectaring habitat. The correct phenology, or timing, of both monarchs and nectar plants and milkweed is important for monarch survival. The position of these resources on the landscape is important as well. In western North America, nectar and milkweed resources are often associated with riparian corridors; and milkweed may function as the principal nectar source for monarchs in more arid regions (Dingle et al. 2005, p. 494; Pelton et al. 2018, p. 18; Waterbury and Potter 2018, p. 38; Dilts et al. 2018, p. 8).

Eastern and western monarch butterflies require overwintering sites that support a very specific microclimate that provide protection from the elements (for example, rain, wind, hail, and excessive radiation) and moderate temperatures, as well as nectar and clean water sources located nearby. The eastern population of monarchs overwinter in oyamel fir (*Abies religiosa*) dominant forests located in mountainous areas, between elevations of 2,900 and 3,300 meters, west of Mexico City, Mexico (Slayback and Brower 2007, p. 147). Most of the observed overwintering sites are located within the Monarch Butterfly Biosphere Reserve (Reserve), which covers over 139,000 acres (Vidal and Rendón-Salinas 2014, p. 169; Ramírez et al. 2015, p. 158). The temperature must remain cool enough to prevent excessive lipid depletion (Alonso-Mejía et al. 1997, p. 935), while at the same time staying warm enough to prevent freezing (Anderson and Brower 1996, pp. 111- 113). Exposure to these cooler temperatures also helps orient the monarchs northward in the spring (Guerra and Reppert 2013, pp. 421-422). The monarchs form dense clusters in the oyamel fir trees (Williams and Brower 2015, pp. 109-110), where they are provided essential protection from the elements, including rain, snow, wind, hail, and excessive solar radiation (Williams and Brower 2015, p. 109). Many sites also provide a source of hydration via nectar plants or a water source (Brower et al. 1977, pp. 237-238).

Migratory monarchs in the western population primarily overwinter in groves a mix of native and nonnative trees along the coast of California and Baja California (Jepsen and Black 2015, p. 149). There are approximately 400 groves that have been occupied, but only a portion of these sites is occupied in any given year. These sites, typically close to the coast, span approximately 1.225 kilometers of coastline (COSEWIC 2010, p. 10). These groves are populated by a variety of tree species, including blue gum eucalyptus (*Eucalyptus globulus*), Monterey pine (*Pinus radiata*), and Monterey cypress (*Hesperocyparis* *macrocarpa*) (Griffiths and Villablanca 2015, pp. 41, 46-47), all of which act as roost trees. These groves provide indirect sunlight for the overwintering monarchs, sources of moisture for hydration, defense against freezing temperatures, and protection against strong winds (Tuskes and Brower 1978, p.149; Leong 1990, pp. 908-910, Leong 1999, p. 213). The close proximity to the coast (average distance of 2.37 kilometers ± 0.39 SE) also provides a mild winter climate (Leong et al. 2004, p. 180).

Population Status

Rangewide Status of the Species

The monarch butterfly has occurrence records in 90 countries, islands, and island groups. The Service delineated these occurrences into 31 historical populations within 8 geographical units, referred to as adaptive capacity units (ACUs). The eight ACUs are designated as the Australian, New Zealand, and Indo-Pacific Islands; Central America and the Caribbean; South Florida; Hawaii; the Iberian Peninsula; South America and Aruba; eastern North America; and western North America. The SSA estimated population sizes of 77,141,600 individuals in eastern North America (based on average of the last 5 years overwintering estimates, assuming a 21.1 million monarch/ha density), 168,365 individuals in western North America (based on average of past 5 years of overwintering counts), 1,424,790 individuals within Australia (based on estimates from M. Zalucki, The University of Queensland (Australia), pers. comm. 2017), and 3-5 million individuals outside of Australia and North America (Zalucki, pers. comm. 2017).

The SSA determined that 27 of the 31 historical populations are extant and 4 have unknown status. Outside of the 2 migratory North American populations, the health of the remaining 29 populations is undeterminable due to limited information available on population trends and stressors. However, at least 15 of these populations are at risk of extinction due to climate change related sea level rise or unsuitably high temperatures (International Panel on Climate Change 2001; Nail et al. 2015b, p. 99). For the purposes of this document, the term 'worldwide,' when used in relation to monarchs, is referring to 29 monarch populations excluding the eastern and western North American populations.

The eastern North American monarch population has been censused annually since 1994 (Vidal and Rendón-Salinas 2014, pp. 167-168). Although the population varies year-to-year, monarchs consistently numbered in the hundreds of millions throughout the 1990s and early 2000s (assuming a 21.1 million monarch/hectare density) (Thogmartin et al. 2017, p. 1). There are additional survey data suggesting that monarch populations were as high or higher in the 2 decades prior to standardized monarch monitoring at the Mexican overwintering sites (Calvert and Brower 1986, pp. 167-19; Vidal and Rendón-Salinas 2014, p. 172). There has been a steady decline in overwintering area occupied since 1994 with the highest season average of 44.95 acres recorded in 1996-1997 and the lowest season average of 5.19 acres recorded in 2020-2021 (Monarch Watch 2021, online).

The western North American population has been censused annually since 1997, providing an estimate of annual population size. Similar to the eastern population, data prior to standardized sampling suggest that the western population numbered at least 4 million monarchs in the 1980s (Schultz et al. 2017, p. 3). The western population has been generally declining over the last 23 years, despite an increasing number of sites being counted (Service 2020b). The 2020 data point is the lowest recorded at below 50,000 monarchs (Western Monarch Count 2021, Xerces Society).

There is little data available on the population of monarch butterflies that exist in Hawaii. The 2020 SSA noted that the monarch is extant in Hawaii, but there are no known trends in population, milkweed, or nectar sources, impacts from insecticides, or predators/parasites and overall condition (Service 2020b).

<u>*Threats*</u>

The primary threats to the North American monarch populations identified in the species status assessment were changes and loss of breeding, migratory, and overwintering habitat (due to conversion of grasslands to agriculture, urban development, widespread use of herbicides, logging/thinning at overwintering sites, unsuitable management of overwintering groves, and drought), continued exposure to insecticides, and effects of climate change.

The availability of milkweed is essential to monarch reproduction and survival. Reductions in milkweed is cited as a key driver in monarch declines (Brower et al. 2012, p. 97; Pleasants and Oberhauser 2013, p.7; Inamine et al. 2016, p. 1081; Thogmartin et al. 2017, p.12; Waterbury and Potter 2018, pp. 42-44; Saunders et al. 2019, p. 8612). A majority of the milkweed loss has occurred in agricultural lands, where intensive herbicide usage for weed control has resulted in widespread milkweed eradication. Pleasants (2017, p. 7), for example, estimated that over 860 million milkweed stems were lost in the Midwest between 1999 and 2014, a decline of almost 40%. Glyphosate use in western agricultural lands has also increased dramatically since the 1990s. As weed species develop increasing resistance to glyphosate, other herbicide (e.g., dicamba) tolerant crops are developed, which can lead to a corresponding increase in herbicide use. Milkweed is also lost on the landscape through development and conversion of grasslands (Lark et al. 2015, pp. 3-4). Between 2008 and 2012, a total of 5.7 million acres of grassland were converted to new cropland, including up to 3 million acres of Conservation Reserve Program (CRP) land (Lark et al. 2015, p. 5). Pleasants and Oberhauser (2013, pp. 5-6) estimate that the loss of agricultural milkweeds in the Midwest has resulted in an 81 percent decline in monarch production, in part because monarch egg densities were higher on milkweed in agricultural fields (3.89 times more eggs than on non-agricultural milkweed). This particularly impacts the eastern monarch population because more Mexico overwintering monarchs originate from the Midwest crop belt region than any other region (with estimates ranging from 38 percent to over 85 percent of all overwintering monarchs originating from the Midwest; Wassenaar and Hobson 1998, pp. 15438- 15439; Flockhart et al. 2017, p. 4). Reductions in nectar resources, particularly within migration routes, are another key driver in monarch declines (Inamine et al. 2016, p. 1081; Thogmartin et al. 2017, p.12; Saunders et al. 2019, p. 8612). Losses of nectar resources are due to the same stressors as identified above for milkweed resources.

Both western and eastern monarchs rely on the microclimate provided by the trees at their overwintering sites (Leong et al. 2004, entire; Williams and Brower 2015, entire) for protection from the elements; therefore, removal or alteration of these overwintering sites make monarch butterflies more susceptible to winter mortality (Bower et al. 2011, p. 43). The western monarch overwintering habitat along the Pacific Coast is threatened by development, particularly urban development (Sakai and Calvert 1991, p. 149; Frey and Schaffner 2004, p. 172). Habitat alteration, due to disease and pests, senescence, improper grove management, fire, and drought, can alter the microclimate of the western overwintering sites and result in less suitable habitat conditions (Jepsen et al. 2015, p. 17; Pelton et al. 2016, pp. 28, 32). Most overwintering sites used by eastern monarchs occur within a 139,019-acre protected area in Mexico. Despite a logging ban within a 33,485-acre core zone of the Reserve (Ramírez et al. 2015, p. 158) and ongoing reforestation efforts (López García 2011, p. 631), this reserve experiences a forest loss of approximately 0 to 2.4 percent per year (Ramírez et al. 2015, p. 163). Between 2002 and 2012, approximately 3,099 acres of the core zone were deforested (<10 percent canopy cover remained) and approximately 2,286 acres were degraded (a decrease in canopy) due to illegal logging, floods, drought strong winds, and fire (Vidal et. al. 2014, p. 180).

The larvae of many Lepidopterans are considered major pest species; therefore, insecticides are tested specifically on this taxon to ensure that they will effectively kill individuals at labeled application rates. Although insecticide use is most often associated with agricultural production (for example, between

2005 and 2012, 60 percent of insecticide applied occurred on agricultural lands, USEPA 2017, p.11), any habitat where monarchs are found may be subject to insecticide use. In addition, monarchs may also be exposed to insecticides in areas beyond the insecticide application points due to drift (Olaya-Arenas and Kaplan 2019, p. 1; Halsch et al. 2020, p. 3). The most widely used classes of insecticide include organophosphates, pyrethroids, and neonicotinoids. Neonicotinoids entered the market in the mid- to late-1990s and because of their high insecticidal activity at low application rates, they are now the most used class of insecticides in the world (Braak et al. 2018, p. 507). Neonicotinoid insecticides are absorbed into plants and distributed throughout their tissues to their stems, leaves, roots, fruits, and flowers. They kill and injure insects by attacking their central nervous system. Studies looking specifically at dose-response of monarchs to neonicotinoids, organophosphates and pyrethroids have demonstrated monarch toxicity (e.g., Krischik et al. 2015, entire; James 2019, entire; Krishnan et al. 2020, entire; Bargar et al. 2020, entire).

Climate change can affect monarch butterflies both directly and indirectly (Nail and Oberhauser 2015, entire). Climate change will result in changing precipitation patterns and temperatures (Williams and Brower 2015, p. 116), therefore directly impact monarch survivability. An increased frequency of severe storms while monarchs are overwintering in Mexico may result in freezing temperatures and catastrophic (up to 80 percent) mortality (Anderson and Brower 1996, p. 112; Brower et al. 2004, entire; Oberhauser and Peterson 2003, p. 14067). Climate change, particularly increasing temperatures, may impact monarch fecundity (Oberhauser 1997, pp. 168-169), mating success (Solensky and Oberhauser 2009, p.6), and survival during migration and while overwintering (Masters et al. 1988, entire; Alonso-Mejía et al. 1997, entire). Laboratory studies indicate optimal temperatures for monarch range from 27 to 29°C with sublethal effects beginning around 30 to 36°C range and an upper lethal thermal limit of 42°C (Zalucki 1982, p. 243; York and Oberhauser 2002, p. 294; Zalucki and Rochester 2004, p. 225; Nail et al. 2015b, p. 101). Temperatures consistently above 33 to 35°C are unsuitable for monarchs (Malcolm et al. 1987, p. 78; Zalucki and Rochester 1999, pp. 155- 157).

Climate change may change the distribution and availability of overwintering habitat and breeding habitat. Current modeling predicts the loss of 38.6 percent to 69.8 percent of current suitable habitat within the Reserve (Zagorski 2016, p. 17). In addition, overwintering sites in Mexico are predicted to become increasingly warm throughout the year and less suitable for the oyamel fir trees, the predominant monarch roosting tree. Rising temperatures may potentially make 50 percent or more of the sites unsuitable for oyamel fir trees by 2030 and completely unsuitable by 2090 (Sáenz-Romero et al. 2012, p. 102; Ramírez et al. 2015, p. 167). In western North America, climate change is predicted to cause an inland and upslope displacement of suitable overwintering conditions, roughly proportional to elevation, of suitable overwintering habitat in coastal California (Fisher et al. 2018, p. 19). Widespread drought causes roosting trees to become more susceptible to pests (Paine and Millar 2002, p. 148). Finally, rising sea levels may result in loss of habitat for coastal non-migratory populations (Tampa Bay Climate Science Advisory Panel 2015, entire).

A warming climate may influence breeding habitat by altering suitable locations for both monarchs (Batalden et al. 2007, pp 1369-1370) and their milkweed host plant (Lemoine 2015, entire). Decreased precipitation may influence the amount and availability of nectar needed for migrating butterflies (Brower et al. 2015, entire; Stevens and Frey 2010, p. 740; Espeset et al. 2016; p. 826; Saunders et al. 2019, p. 8612). High temperatures and drought conditions may be particularly impactful during the crucial spring migration (C. Taylor, University of Kansas, pers. comm. 2020). While drought and increased temperatures may reduce monarch habitat in some areas, the climatically suitable niche for monarchs may increase, potentially increasing their summer breeding grounds if both monarchs and milkweed are able to adapt (Lemoine 2015, pp. 10-17).

Climate change may impact monarchs in ways that are more difficult to measure. This may include phenological mismatch (e.g., timing of milkweed and nectar sources not aligning with monarch migration; Thogmartin et al. 2017, p. 13) or range mismatch with associated species (e.g., changed environmental suitability of monarch natural enemies; McCoshum et al. 2016, p. 229-233). Furthermore, recent research suggests that carbon dioxide may impact the medicinal properties of some milkweed species, potentially leading to increased virulence of the protozoan parasite *Ophryocystis elektroscirrha* (OE) parasite virulence and decreased monarch tolerance of OE infections (Decker et al. 2018, p. 7).

Recovery Plan Information

There is not a recovery plan for the species.

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Mount Hermon June Beetle

Listing Status

The Mount Hermon June beetle was federally listed as endangered in 1997 (62 FR 3616). The Mount Hermon June beetle was originally listed as an endangered species because of historical loss of habitat and several actual or potential future actions that could further reduce the amount of suitable habitat that supports the species.

Life History and Habitat

The Mount Hermon June beetle is univoltine (i.e., having only one generation per year). As its common name suggests, adult emergence and seasonal activity often begins in June. Historical collection records (Young 1988; BUGGY Database 2003) indicate that adult males have been observed in the months of June, July, August, and September. Specific life history information for the Mount Hermon June beetle is limited but can be inferred from related species (Buckhorn and Orr 1961; Downes and Andison 1941; Kard and Hain 1990; Lilly and Shorthouse 1971; Van Steenwyk and Rough 1989). Presumably the entire lifecycle (i.e., egg, larva, pupa, and adult) takes 2 to 3 years to complete. The majority of the Mount Hermon June beetle's lifecycle is spent as a subterranean larval stage that feeds on plant roots.

The Mount Hermon June beetle has been found in association with Zayante sands and vegetation characteristic of maritime chaparral, ponderosa pine forest, sand parkland, and mixed deciduous-evergreen forest. In addition, adults have been found in disturbed sandy areas where remnants of these habitats still occur (Arnold 1999a). The species has been recorded from approximately 80 locations in Zayante Sandhills habitat in the vicinity of Mount Hermon, Felton, Ben Lomond, Zayante, and Scotts Valley. Currently, the entire known range of the Mount Hermon June beetle covers an area of less than 10,000 acres. The amount of habitat within this area that the Mount Hermon June beetle occupies is unknown.

Population Status

The Mount Hermon June beetle is restricted to Zayante sand soils (Bowman and Estrada 1980) derived from ancient sand deposits, known as the Santa Margarita formation (Marangio and Morgan 1987), which are found in the Scotts Valley-Mount Hermon-Felton-Ben Lomond area of the Santa Cruz Mountains. Throughout most of its range, the primary threats to the species are loss of habitat from sand mining and urbanization, and habitat degradation due to invasive plants and unnatural succession. In addition, land uses such as agricultural conversion and recreation (e.g., hiking, horseback riding, mountain biking, and off-road vehicle use) have resulted in loss or degradation of habitat. Herbicide or insecticide use and overcollection by insect collectors are also considered potential threats to the Mount Hermon June beetle and/or its habitat. The severe fragmentation of the Zayante Sandhills, coupled with the short dispersal distance of adult males of the Mount Hermon June beetle and minimal dispersal capability of flightless females, threaten the genetic exchange between populations of the Mount Hermon June beetle. Stochastic events could result in the loss of highly fragmented, small populations of the Mount Hermon June beetle.

Recovery Plan Information

A recovery plan for the species was published in 1998 (Service 1998). The recovery plan (Service 1998) described three actions necessary to downlist the Mount Hermon June beetle. These actions include: a) protection of the 28 known (as of 1998) collection sites (consisting of 7 discrete areas) of sand parkland habitat through fee-title acquisition, conservation easements, or habitat conservation plans; b) development and implementation of a management plan for the Quail Hollow Ranch County Park; and c) ensuring stable or increasing populations of the Mount Hermon June beetle. The recovery plan states that when the downlisting criteria have been met the species can be considered for delisting if: threats are reduced or eliminated so that populations are capable of persisting without significant human intervention or perpetual endowments are secured for management necessary to maintain the continued existence of the species (Service 1998).

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Myrtle's Silverspot Butterfly

Listing Status

The Myrtle's silverspot butterfly was listed as endangered in June 1992 (57 FR 27848).

Life History and Habitat

The Myrtle's silverspot butterfly is a medium sized brown butterfly and member of the brush-foot family (Nymphalidae) (USFWS 1998). The larval host plant for the Myrtle's silverspot butterfly is *Viola adunca* (western dog violet). This violet serves as the only known larval food plant for Myrtle's silverspot butterfly, while a variety of other native (e.g., gumplant, western pennyroyal, yellow sand verbena, seaside daisy, and mule ears) and non-native (e.g., bull thistle and Italian thistle) flowering plants serve as nectar sources for the adult. Typical habitat supporting the Myrtle's silverspot butterfly and its host plant are coastal dunes, coastal scrub, or coastal prairie at elevations ranging from sea level to 1,000 feet and as far as three miles inland (USFWS 1998; 2009; 2021).

The Myrtle's silverspot butterfly is found among coastal dunes, coastal prairies and coastal scrub that are protected from winds and contain the caterpillar's host plant (USFWS 1998). The coastal areas inhabited by the Myrtle's silverspot butterfly are commonly buffeted by strong onshore winds, and, although the adults are known to be fairly strong flyers, the butterfly is more often active on days with low wind. The caterpillar's host plant is typically found in damp banks or on the edge of forest meadows (USFWS 1998).

The Myrtle's silverspot is a medium-sized butterfly with a wingspan averaging 2.1-2.3 inches (USFWS 1998). The upper sides of the fore and hind wing surfaces are golden brown to reddish brown with many conspicuous black spots, lines, and other markings, sometimes with a greenish tinge basally. The undersides are light tan, reddish brown, and brown with black lines and distinctive silver spots and black spots. The base of the wings and the body are densely covered with hairs (USFWS 1998).

The Myrtle's silverspot butterfly reproduces once per year as a species (USFWS 1998). Adult Myrtle's silverspot butterflies emerge from their pupae between mid-June and mid-July and live two to five weeks. The total flight period, however, lasts for two to three months (mid-June to early October) since adult emergence is staggered. Females lay one egg at a time solely on the dried leaves and stems of the host plant, *Viola adunca*. The number of eggs females lay is highly correlated with the amount of nectar they consume (USFWS 1998).

Larvae emerge from their eggs a few weeks after being laid (USFWS 1998). New larvae migrate a short distance into suitable foliage or leaf litter and spin a silk web where they remain in a suspended and inactive state known as diapause through the fall and winter. In spring, diapause ends and larvae begin searching for and feeding on the fresh leaves of the host plant. Larvae feed for 7 to 10 weeks and then form a cocoon from leaf debris and silk. The pupal stage for the Myrtle's silverspot butterfly lasts for about two weeks (USFWS 1998).

Emergence from the cocoon typically occurs from mid-June to mid-July (USFWS 1998). Adults are active during calm weather between mid-June and early October and inactive during windy and foggy periods. They can travel miles if needed in search of nectar, mates, or violets. Adults live up to five weeks (USFWS 1998).

The butterfly continues to be threatened by (USFWS 2021):

- Habitat loss
- Climate change

- Non-native plants
- Hobby collection
- Small populations
- Fire suppression
- Vehicle strikes along roads
- Inappropriate levels of grazing (including either intensive grazing or elimination thereof)
- Trampling by hikers

Population Status

The historical range of the Myrtle's silverspot butterfly is believed to have included the northern California coastal dunes and bluffs from the river mouth of the Russian River in Sonoma County, and southward to Point Año Nuevo in San Mateo County (USFWS 1998). By the late 1970s, Myrtle's silverspot butterfly was thought to be gone south of the Golden Gate Bridge (USFWS 1998). Its current range includes western Marin and Sonoma counties, including Point Reyes National Seashore (USFWS 2021).

Recovery Plan Information

On September 29, 1998, the Service issued the Recovery Plan for Seven Coastal Plants and the Myrtle's Silverspot Butterfly (USFWS 1998).

Recovery Actions

Recovery criteria for downlisting this species include the following:

1. The habitat of the northwestern Main County/southwestern Sonoma County population of this species is protected in perpetuity
2. Two new populations have been discovered or re-introduced at suitable sites that have been protected in perpetuity.
3. Adequate funding for management of all sites is assured and adaptive management plans have been developed and are being implemented.
4. Annual monitoring has shown the five populations (three existing, two new) cumulatively to have a total of more than 10,000 adults in each often years, with no individual population having fewer than 200 adults in any year and no recent severe declines.

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Oregon Silverspot Butterfly

Listing Status

The Oregon silverspot butterfly was listed as threatened in 1980 (Service 1980). The Service completed a recovery plan for the species in 1982 and published a revised recovery plan in 2001 (Service 1982, Service 2001). The Oregon silverspot butterfly recovery priority number is three, indicating a high degree of threat and recovery potential for the species (Service 2001).

Life History and Habitat

The Oregon silverspot butterfly occupies four types of grassland habitats: marine terrace, coastal headland "salt spray" meadows, stabilized dunes, and montane grasslands. To support the butterfly, each habitat area must provide the caterpillar host plant, early blue violets, and adult butterfly nectar sources. Violet density influences the number and location of Oregon silverspot butterfly eggs laid, with areas of higher violet densities used most frequently for ovipositing.

Native nectar plants most frequently used by the adult butterflies are Solidago canadensis (Canada goldenrod), Solidago spathulata (dune goldenrod) Symphyotrichum chilense (Pacific aster), Anaphalis margaritacea (western pearly everlasting), Cirsium edule (edible thistle), and Achillea millefolium (common yarrow).

The life cycle of the Oregon silverspot butterfly begins when the adult female deposits eggs during late August-September. Eggs are laid within or adjacent to areas which contain early blue violets. The larvae hatch in approximately sixteen days, and the newly hatched larvae wander a short distance to find a suitable place for diapause (*i.e.,* suspension of growth for overwintering). In late spring and early summer, the larvae emerge to feed on the violet leaves. The larvae feed and grow for two months going through six instars (*i.e.,* developmental stages). Larvae then seek shelter to pupate. At least two weeks later (July-September) the butterfly emerges from its chrysalis as an adult, with males emerging a few weeks prior to females. The adult silverspot butterflies leave the windy meadows for shelter in an adjacent forest. There, the butterflies will feed on nectar-producing flowers (composites) and find a mate. Mating usually takes place in relatively sheltered areas. The gravid (*i.e.,* mated, egg-bearing) female returns to the meadow to lay eggs in August-September. An individual female may lay 200-300 eggs.

Central to the life cycle of the Oregon silverspot butterfly is the abundance of the caterpillar host plant, the early blue violet (Viola adunca). Field studies have demonstrated that female butterflies select areas with high violet densities for egg-laying (Service 2001, Damiani 2011). Based on laboratory studies 200-300 violets leaves are needed to allow an Oregon silverspot butterfly to develop from caterpillar to pupae. In the wild a caterpillar would require a clump of approximately 16 violet plants for development, assuming each violet could provide about 12 to 20 leaves. Based on studies of other butterflies, nectar abundance and quality are also important to adult survival and particularly fecundity (Schultz and Dlugosch 1999, Boggs and Ross 1993, Mevi-Schutz and Erhard 2005).

Both violet abundance and butterfly native nectar sources have declined at all Oregon silverspot butterfly habitat areas due primarily to competition from non-native vegetation. Habitat disturbance regimes, that maintain an early seral habitat stage, have been altered dramatically over the past 150 years, increasing the rate of grassland succession to shrub or forest. Non- native plants have played a role in stabilizing the previously dynamic coastal ecosystem.

Detailed accounts of the taxonomy, ecology, reproductive characteristics, range, distribution, habitat requirements, and habitat management of the Oregon silverspot butterfly are found in the revised recovery plan (Service 2001).

Population Status

Historically, the Oregon silverspot butterfly was distributed along the Washington and Oregon coasts from Westport in Grays Harbor County, Washington, south to Heceta Head in Lane County, Oregon, with a disjunct population located north of Crescent City in Del Norte County, California. At least 20 separate locations were known to support Oregon silverspot butterfly in the past, discovered 1895-1975 (McCorkle 1980). At the time of listing in 1980, only the Rock Creek-Big Creek population and what was then called the Tenmile Creek population, now called the Bray Pt. population, were considered healthy. One population in Washington and 7 populations in Oregon were mentioned in the 1980 listing document. There are seven remaining populations of Oregon silverspot butterfly- six in Oregon and one in northern California (Table 1). Each small population is at great risk of extirpation. The Oregon silverspot butterfly 5-Year Review (Service 2012) concluded that the butterfly "*is in danger of extinction throughout its range*" and recommended an up-listing to endangered status. Standardized butterfly survey methods using a modified Pollard method (Pollard 1977) have been conducted at four Oregon occupied sites annually, 1990 to 2014 (Patterson 2014). The Del Norte County, California, site has been monitored using the same method annually 2005 to 2014 (Service 2014). The survey results produce an index of abundance value which provides a relative population measure from year to year. (Table 1). These index counts are not designed to estimate population size in smaller populations but do provide a measure to compare year to year variation.

Butterfly population size is the most significant factor contributing to population size the following year (Service 2012). Small populations are much more likely to become extirpated than larger populations. The combined threats to small, isolated populations, habitat degradation, and climate change continue to endanger the species throughout its range. Without augmentations the three coastal Oregon populations would likely be extirpated leaving only the Mt. Hebo and Del Norte populations.

In 2014, the Mt. Hebo population crashed, falling to less than 600 butterflies, the lowest count in 25 years. The 25-year average index count on Mt. Hebo is 1,871 butterflies with a high count of 4,983 in 1999 and a low count of 582 in 2014. In addition, the captive butterflies laid only one third the expected numbers of eggs in August 2014, resulting in another drastic reduction to the number of butterflies available for site augmentation in 2015. With the only viable population (Mt. Hebo) currently in drastic decline, and the other four tenuous populations located in deteriorating habitat, the risk of extinction is real and immediate.

Yearly surveys are conducted at all known populations of Oregon silverspot using a modified Pollard survey (Pollard 1977). These counts are population indices and thus are not statistically rigorous population estimates. However, these indices provide values that are comparable year-to-year. Individuals site indices range from 0 to 3,091 butterflies across the survey years. Range-wide indices range from 536 to 4,277 butterflies across the survey years. Although trends vary, in general the range-wide index is in decline. To buffer this subspecies against extinction, the Service and its partners augment most populations with larvae and/or pupae (and in some instances adults). Yearly indices with augmentation numbers since 2010 are included in Table 1. Graphical representations of population indices are found in Figure 1. Augmentation efforts began in 2001 with Oregon Zoo and later Woodland Park Zoo raising larvae in captivity (Anderson *et al.* 2010; Van Buskirk 2010). This has helped buffer the subspecies against extinction by providing an insurance cohort in captivity each year.

Table 1. Population indices from 2010 to 2021 at locations known to be occupied by Oregon silverspot butterfly (*Speyeria zerene hippolyta*). Indices include the number of captively-reared individuals released as pupae[1], larvae[2], or adults[3] per site, by year. Site names in italics are those locations where Oregon silverspots have been reintroduced (Derrenbacher pers. comm. 2021).

Location	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021

Mt. Hebo	1,334	1,377	3,091	1,489	582	120	461 (597[1])	379 (531[1])	764 (59[1])	1,171 (285[1])	1,423 (67[1])	1,708 (104[1], 10[2])
Cascade Head	610 (1017[1])	643 (1089[1])	103	88	87 (89[2])	20 (48[1])	13 (47[1])	9	5	12 (140[2])	3 (150[2])	3 (46[1])
Bray Pt./ Agate Mead	140 (1356[1])	204 (560[1])	341 (851[1], 259[2])	133 (672[1])	105 (631[1], 93[2])	3 (477[1])	26 (137[1])	NA	4	2 (171[2])	18 (50[2])	3 (70[2])
Rock Creek/ Big Creek	426 (665[2])	352	251 (734[1], 259[2])	302 (582[1])	199 (723[1])	158 (301[1])	115 (67[1])	82 (162[1])	45	151 (300[2])	190 (368[2])	160 (100[1], 117[2])
Lake Earl	352	625	491	332	438	264	89	7	4	1	0	0
Nestucca Bay NWR								59 (927[2])	21 (105[1])	17 (458[2], 12[3])	43 (594[2], 5[3])	52 (159[1], 33[3])
Saddle Mountain									27 (545[2])	41 (504[2])	85 (553[2])	38 (250[2])
TOTAL COUNT	**2,862**	**3,201**	**4,277**	**2,344**	**1,411**	**565**	**704**	**536**	**870**	**1,395**	**1,762**	**1,965**

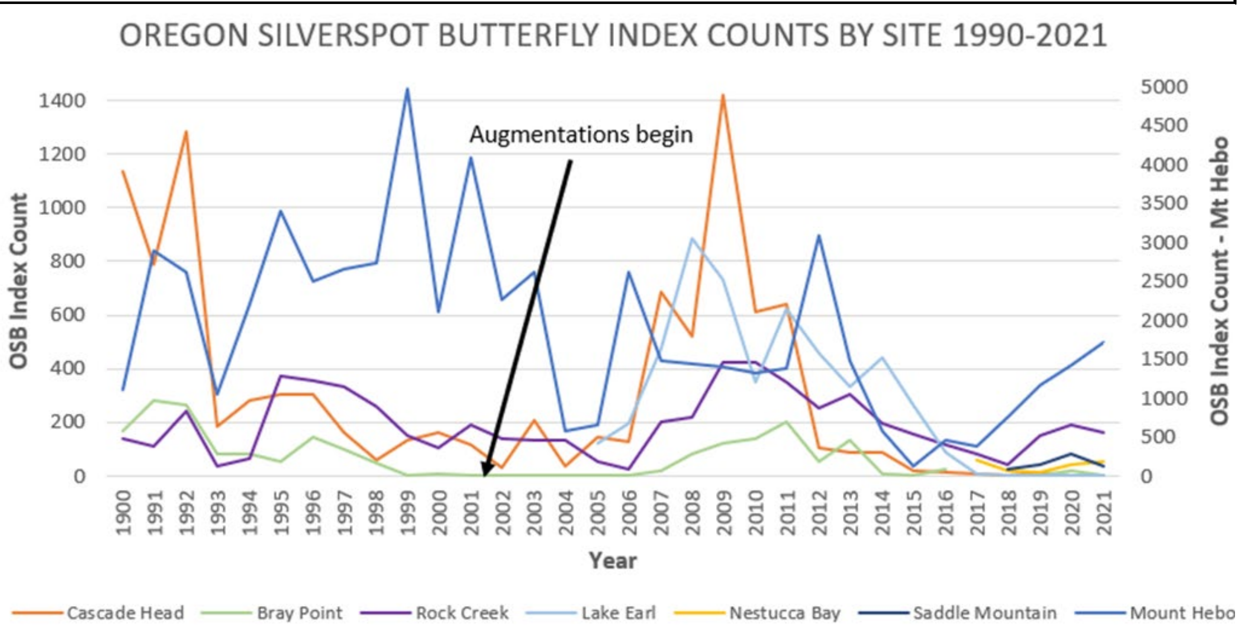

Figure 1. Population indices from 1990 to 2021 at locations known to be occupied by Oregon silverspot butterfly (*Speyeria zerene hippolyta*). Indices include the number of captively-reared individuals from 2001 onward. The left

y-axis represents index count number at all sites except for Mount Hebo, which has one order of magnitude more individuals, thus the right y-axis is used to scale the Mount Hebo index (Derrenbacher pers. comm. 2021).

Recovery Plan Information

The revised final recovery plan for Oregon silverspot butterfly was published in 2001 (Service 2001). Conservation needs of the Behren's silverspot butterfly are best summarized by downlisting and recovery objectives for the species in the final recovery plan. The delisting criteria are: (1) At least two viable Oregon silverspot butterfly populations exist in protected habitat in each of the following areas: Coastal Mountains, Cascade Head, and Central Coast in Oregon; and Del Norte County in California; and at least one viable Oregon silverspot butterfly population exists in protected habitat in each of the following areas: Long Beach Peninsula, Washington and Clatsop Plains, Oregon. This includes development of comprehensive management plans. (2) Habitats are managed long-term to maintain native, early successional grassland communities. Habitat management maintains and enhances early blue violet abundance, provides a minimum of five native nectar species dispersed abundantly throughout the habitat and flowering throughout the entire flight period, and reduces the abundance of invasive non-native plant species. (3) Managed habitat at each population site supports a minimum viable population of 200 to 500 butterflies for at least 10 years.

The conservation strategy described in the recovery plan includes four key priority actions: (1) Protect and enhance existing habitat in each of six habitat conservation areas; (2 Determine ecological requirements, population constraints, and management needs of the Oregon silverspot butterfly; (3) monitor the Oregon silverspot butterfly's status and habitat; and (4) reduce take.

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Quino Checkerspot Butterfly and its Critical Habitat

Listing Status

The Service listed the Quino checkerspot butterfly as endangered on January 16, 1997 (62 FR 2313) and issued a recovery plan for the species on August 11, 2003 (Service 2003b). An amendment to the recovery plan was finalized in January 2020 (Service 2020). Critical habitat for Quino was designated on April 15, 2002 (67 FR 18356) and revised on June 17, 2009 (Service 2009b).

Life History and Habitat

The Quino life cycle includes four distinct life stages: egg, larva (caterpillar), pupa (chrysalis), and adult, with the larval stage divided into 5 to 7 instars (periods between molts, or shedding skin) (Service 2003a, p. 157). There is usually one generation of adults per year, although larvae may remain in diapause (summer dormancy) for multiple years prior to maturation (Service 2003a, p. 8).

Quino are exothermic (cold-blooded) and therefore require an external heat source to increase their metabolic rate to levels needed for normal growth and behavior. Within open, woody canopy communities, larvae seek microclimates with high solar exposure for basking in order to speed their growth rate (Weiss et al. 1987, p. 161; Weiss et al. 1988, p. 1487; Osborne and Redak 2000, p. 113; Service 2003a, p. 20). Like most butterflies, adult Quino frequently bask and remain in sunny areas to increase their body temperature to the level required for normal active behavior (Service 2003a, p. 18).

Quino habitat is characterized by patchy shrub or small tree landscapes with openings of several meters between large plants, or a landscape of open swales alternating with dense patches of shrubs (Mattoni et al. 1997, p. 112); such habitats are often collectively termed “scrublands.” Quino will frequently perch on vegetation or other substrates to mate or bask, and require open areas to facilitate movement (Service 2003a, pp. 10-11).

Adult butterflies will only deposit eggs on species they recognize as host plants. Quino oviposition (i.e., egg deposition) has been documented on *Plantago erecta* (erect or dwarf plantain), *Plantago patagonica* (Patagonian plantain), and *Anterrhinum coulterianum* (white snapdragon) (Service 2003a, pp. 14-18). In 2008, oviposition and larval development were recorded for the first time on a new species of host plant, *Collinsia concolor* (Chinese houses) (Pratt, pers. comm. 2008a, p. 1; 2008b, p. 1; 2008c, p. 1; 2008d, p. 1; 2008e, p. 1). Although C. concolor commonly occurs in habitats with *P. erecta, P. patagonica*, and *A. coulterianum*, (Pratt 2001, pp. 42-43; Anderson unpubl. data 2008, pp. 2-3), this plant species is typically found in cooler and moister micro-habitats that tend to grow in the shade on north facing slopes (Pratt 2001, p. 40; Pratt, pers. comm. 2008b, p. 1).

Newly hatched pre-diapause larvae cannot move more than a few centimeters during the first two instars, restricting their development during this stage to the individual host plant where the eggs were deposited. Older pre-diapause larvae usually wander independently in search of food and may switch to feeding on a different species of host plant (Service 2003a, p. 7). All known species of host plant (see species listed above) may serve as primary or secondary host plants, depending on location and environmental conditions (Service 2003a, p. 17). The physical structure of flowers is the primary factor that determines nectar source use. Adult checkerspot butterflies of the genus *Euphydryas* have a short tongue, approximately 0.43 inch (11 millimeters) long (Pratt, pers. comm. 2007a, p. 1), and typically cannot feed on flowers that have deep corolla tubes or flowers evolved to be opened by bees (Service 2003a, p. 19).

Although adults may nectar on flowers with a corolla length nearly a centimeter longer than their proboscis (0.59-1.10 inch (15-28 millimeters)), such as Linanthus androsaceus (false baby stars) (Murphy 1984, p. 114; Hickman 1993, p. 842), they are not likely to prefer such species (Murphy 1984, p. 114).

Therefore, flowers with a corolla tube greater than 0.43 inch (11 millimeters) are less likely to be used as nectar sources by the Quino. Edith's checkerspot butterflies prefer flowers with a platform-like surface on which they can remain upright while feeding (Service 2003a, p. 19).

White and Levin (1981, pp. 350-351) found that adult Quino's within-habitat patch movement distances from larval host plant patches to adult nectar sources often exceeded 656 feet (200 meters). Movement distances greater than this distance were the extreme values recorded by White and Levin (1981, p. 349), as 656 feet (200 meters) was more than double the average recapture distance in 1972, and almost 4 times the average distance in 1973. Therefore, nectar sources greater than 656 feet (200 meters) from larval host plants are not likely used by the subspecies.

It is not possible to determine habitat suitability based on standing host plant densities. Densities of *Plantago erecta* required for larval development have been estimated (Service 2003a, pp. 22-23); however, it is not always possible to determine typical host plant densities because: (1) Germinating host plants may be entirely consumed by larvae; or (2) seeds may not germinate and larvae may return to in diapause when precipitation levels are below-average (Service 2003a, p. 23). These principles apply to all host plant species to some extent; therefore, host plants detected in habitat appearing otherwise suitable should be considered an indicator of habitat suitability.

Population Status

The Quino checkerspot butterfly was historically found from the coastal slopes of Los Angeles, Orange, and San Diego counties as well as northern Baja California east to southwestern San Bernardino County and the western edge of the upper Anza-Borrego desert. Overall, more than 75 percent of the historical range of the Quino has been lost (Brown 1991; Service 2003b), and more than 90 percent of the subspecies' coastal mesa and bluff habitat, where most historical records are located, has been destroyed by habitat fragmentation, degradation, and development (Service database). Current information suggests that Quino has been extirpated from Los Angeles, Orange, and San Bernardino and the northern locations in Riverside County. The Quino is now known only from western Riverside County, San Diego County, and northern Baja California, Mexico.

Local distributions of Quino change dramatically over time, individual Quino observations do not adequately represent local distributions. Therefore, we discuss Quino population locations in terms of "occurrence complexes" (Service 2003b), which are our best estimators of approximate population location and population membership. Occurrence complexes are mapped in the recovery plan using a 0.6-mile (1-kilometer) movement radius from each butterfly observation, and may be based on the observation of a single individual. Occurrences within approximately 1.2 miles (2 kilometers) of each other are considered to be part of the same occurrence complex, as these occurrences are proximal enough that the observed butterflies were likely to have come from the same population (Service 2003b). Occurrence complexes may expand due to new butterfly observations, or contract due to habitat loss (e.g., occurrence complexes are defined in part by extant habitat) (Service 2003b).

The recovery plan identifies six recovery units throughout Riverside and San Diego counties and describes the known extant occurrence complexes (or metapopulations) throughout the range of the subspecies (as updated by the 2020 amendment). Since the 2003 recovery plan, surveys have identified additional occurrence complexes and expanded some, while others have been lost (Service 2020, Table 1) or significantly reduced in distribution. The entire Northwest Riverside Recovery Unit is now believed to be unoccupied, and not likely to be recolonized without assistance. Furthermore, one of the two core occurrence complexes in the Southwest

Riverside Recovery Unit (Warm Springs Creek) is also likely extirpated. In western Riverside County, approximately a dozen occurrence complexes are believed to have been extirpated by habitat loss, isolation, or both since recovery plan publication. It will require intensive management to meet recovery criteria in these compromised recovery units, if that is possible, including measures such as habitat restoration, weed control, and assisted recolonization.

Within San Diego County, there are currently 37 occurrence complexes identified as extant, including 6 core areas (Service 2020) and 3 designated recovery units. New Quino observations in San Diego County (USFWS GIS database) between occurrence complexes identified in the recovery plan have resulted in merging of the Otay Valley, West Otay Mountain, Otay Lakes, Proctor Valley, Dulzura, and Honey Springs occurrence complexes into a single, expanded Otay Occurrence Complex (Service 2009a). The merging of occurrence complexes in the Otay area was expected based on the recovery plan, which noted that occupied habitat in the vicinity of Otay Lakes and Rancho Jamul is an area of key landscape connectivity for all subpopulations in southwest San Diego County (Service 2003b).

Critical Habitat

Approximately 62,125 acres of critical habitat for Quino within nine units are designated throughout the species' current range in the United States (i.e., Riverside and San Diego counties, California). Designated critical habitat includes sufficient habitat to maintain self-sustaining populations of Quino throughout its range. The individual units contain essential habitat for Quino and help to identify special management considerations for the species.

The Physical and Biological Features (PBFs) for Quino are those habitat features that are essential for larval diapause and feeding; pupation; adult oviposition, nectaring, roosting, basking, and dispersal; genetic exchange; and shelter. These habitat features include but are not limited to: space for individual and population growth and for normal behavior; food, water, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, and rearing of offspring; and habitats that are protected from disturbance or are representative of the historical and geographical and ecological distributions of Quino. The PBFs essential to the conservation of Quino are:

1. Grassland and open-canopy woody plant communities, such as coastal sage scrub, open red shank chaparral, and open juniper woodland, with host plants or nectar plants;

2. Undeveloped areas containing grassland or open-canopy woody plant communities, within and between habitat patches, utilized for Quino checkerspot butterfly mating, basking, and movement; or

3. Prominent topographic features, such as hills and/or ridges, with an open woody or herbaceous canopy at the top. Prominence should be determined relative to other local topographic features.

Recovery Plan Information

The Quino recovery plan identifies six recovery units throughout Riverside and San Diego counties and describes the known extant occurrence complexes (or metapopulations) throughout the range of the subspecies (as updated by the 2020 amendment). Since the 2003 recovery plan, surveys have identified additional occurrence complexes and expanded some, while others have been lost (Service 2020, Table 1) or significantly reduced in distribution. The entire Northwest Riverside Recovery Unit is now believed to be unoccupied, and not likely to be recolonized without assistance. Furthermore, one of the two core occurrence complexes in the Southwest Riverside Recovery Unit (Warm Springs Creek) is also likely extirpated. In western Riverside County, approximately a dozen occurrence complexes are believed to have been extirpated by habitat loss, isolation, or both since recovery plan publication. It will require intensive management to meet recovery criteria in these compromised recovery units, if that is possible, including measures such as habitat restoration, weed control, and assisted recolonization. Conservation needs include protecting habitat supporting known current populations (occurrence complexes) and landscape connectivity among them; and managing and enhancing Quino habitat. Habitat patch suitability is determined primarily by larval host plant density, topographic diversity, nectar resource availability, and climatic conditions (Service 2003a). Quino are generally found in open areas and ecotone situations within a variety of plant communities, including grasslands, chaparral, and coastal sage scrub. Open areas within a given vegetation community appear to be critical landscape features for Quino populations. Optimal habitat appears to contain little or no invasive exotic vegetation and a well-developed cryptogamic crust. With the continual threat of non-native invasive plants, active management will be necessary in some areas to maintain habitat suitability.

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San Bruno Elfin Butterfly

Listing Status

The species was listed as endangered on June 1, 1976 (41 FR 22041).

Life History and Habitat

The San Bruno elfin (*Callophrys mossii bayensis*) is a small butterfly with a wingspan of 2.0 to 2.4 centimeters (USFWS 1984). In adults of both sexes, the wings are brown on the upperside and reddish brown on the underside with a whitish, irregular median line. The adult flight period is late February to mid-April. Eggs are laid in small clusters or strings on the upper or lower surface of the larval hostplant, *Sedum spathulifolium* (stonecrop). Typical habitat is coastal grassland and low scrub of north-facing slopes within the fog belt where the larval host plant grows (USFWS 1984).

The butterfly's larval host plant is *Sedum spathulifolium* (stonecrop) (USFWS 1984). The adults' preferred nectar source is common lomatium. Adults may drink the nectar of early-blooming coastal flowers, especially hog fennel, using a long tube called a proboscis that extends from the underside of the head (USFWS 1984).

The adult flight period is late February to mid-April (USFWS 1984). Eggs are laid in small clusters or strings on the upper or lower surface of the larval hostplant. Adults are highly sedentary and move less than 100 meters on average and no more than 800 meters from their larval host plant. Larvae emerge in five to seven days and feed on the stonecrop host plant. The developing larvae have a mutualistic relationship with native ants that defend the larvae from predation and parasitism in return for honeydew secreted by the larvae. However, this mutualistic relationship with native ants may be disrupted by the presence of non-native Argentine ants resulting in increasing rates of predation and parasitism of larvae (USFWS 1984, 2019). Larvae complete their development in late May or early June and enter the pupal phase. Pupation occurs among the loose soil and litter of the host plant stonecrop's roots. The pupal stage lasts from June until the following March (USFWS 1984).

The butterfly continues to be threatened by (USFWS 2019, 2021):

- Public infrastructure development
- Climate change
- Illegal collection
- Habitat modification by non-native plant species
- Parasitism and predation of larvae potentially exacerbated by non-native Argentine ants
- Pesticides
- Small populations
- Trampling larval host plants during population monitoring

Population Status

All known locations are restricted to San Mateo County, California, where several populations are known from San Bruno Mountain, Milagra Ridge, the San Francisco Peninsula Watershed, and Montara Mountain (USFWS 2019, 2021).

Recovery Plan Information

On October 10, 1984, the Service issued the Recovery Plan for the San Bruno Elfin and Mission Blue Butterflies which was later amended in 2019 (USFWS 1984; 2019).

Recovery Actions

The downlisting criteria for this species (USFWS 2019) include:

1. Sites supporting metapopulations of the San Bruno elfin butterfly across the historic range of the species (see criterion number 2 below), including San Bruno Mountain, Milagra Ridge, and the Montara Mountain region, must be managed to ensure the maintenance of habitat that includes a diversity of nectar plants and the larval host plant Sedum spathulifolium and to control threats. Long-term maintenance of the sites must be financially sustainable. Use of herbicides, mowing, burning, or livestock grazing in management should be implemented with appropriate methods and timing to avoid impacts to the butterfly and its nectar and host plants.

2. Sites support metapopulations across the historic range of the species, including San Bruno Mountain, Milagra Ridge, and the Montara Mountain region. San Bruno Mountain must include a minimum of 7 colonies, the Montara Mountain region must include a minimum of 5 colonies (including Peak Mountain and Whiting Ridge), and Milagra Ridge must include a minimum of 2 colonies. Each of these metapopulations must contain an average of at least 30 adults with a stable or increasing population trend for a minimum of 10 years. Habitat patches in sites supporting colonies in criterion number 2 have a stable or increasing areal extent over the same 10-year period of population growth.

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Smith's Blue Butterfly

Listing Status

The Service listed the Smith's blue butterfly as endangered on June 1, 1976 (41 FR 22041 22044). Critical habitat was proposed on February 8, 1977 (42 FR 7972), but was not designated. The decline of the Smith's blue butterfly is attributed to degradation and loss of habitat as a result of urban development, recreational activities in dune habitats, sand mining, military activities, fire suppression in chaparral habitat, and encroachment of exotic plant species.

Life History and Habitat

Smith's blue butterflies co-occur with buckwheat plants that grow in coastal dune, cliffside chaparral, coastal scrub, and coastal grassland communities from the mouth of the Salinas River in Monterey County to San Carpoforo Creek in northern San Luis Obispo County. The Smith's blue butterfly is inextricably dependent upon its host plant species, seacliff buckwheat (*Eriogonum parviflorium*) and coast buckwheat (*Eriogonum latifolium*), during all life stages, except that adults may also feed on nectar from naked buckwheat (*Eriogonum nudum*).

Population Status

Smith's blue butterflies are found within two disjunct areas within their range: 1) a northern area of primarily dune habitats along Monterey Bay north of the Monterey Peninsula, and 2) a southern area of primarily scrub, chaparral, and grassland habitats of the Carmel Valley and Big Sur Coast south of the Monterey Peninsula (Service 2006, p. 6). Long-term monitoring has only been conducted on the Salinas River National Wildlife Refuge since 2015 (Service 2020b, p. 1). Most of our knowledge of the distribution of the Smith's blue butterfly is the result of singular observations made in the past 30 years. Therefore, the number, size, and persistence of colonies throughout the range of the species are poorly understood.

Urban development, recreational activities, and other activities continue to result in habitat loss and degradation. Urban development, introduction of invasive plant species and recreational use have fragmented and continue to fragment habitat for the Smith's blue butterfly. This fragmentation has several ramifications for the Smith's blue butterfly. The quality of the remaining suitable habitat is reduced, the distance dispersing adults must travel to reach the next island of suitable habitat is increased, the entire metapopulation structure is potentially disrupted, and genetic diversity is reduced. Overall, groups of Smith's blue butterflies occupying smaller, more isolated stands of suitable habitat are more likely to be extirpated by stochastic or anthropogenic factors.

Recovery Plan Information

The Service completed a recovery plan for the species on November 9, 1984 (Service 1984). The Smith's blue butterfly recovery plan objectives focus on protection of those localities that were known when the plan was published (Service 1984). However, due to changes in our knowledge of the subspecies' range and the threats that it faces, the objectives are largely obsolete. The general recovery needs of the Smith's blue butterfly include conserving and managing existing habitat, maintaining and improving connectivity between areas of habitat, and increasing the amount of occupied habitat through restoration efforts. Although the recovery plan is outdated, several of the recovery actions are still valid, including: (1) Revegetating existing blow-out areas with native plants and removing exotic plants; (2) Controlling off-road vehicle use of dunes; (3) Carrying out prescribed burns; (4) Iceplant and Holland dune grass eradication; and (5) Developing public awareness.

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Valley Elderberry Longhorn Beetle

Listing Status

The Valley elderberry longhorn beetle was listed as threatened on August 8, 1980 (45 FR 52803). Critical habitat was designated for the Valley elderberry longhorn beetle on August 8, 1980 (45 FR 52803).

Life History and Habitat

The valley elderberry longhorn beetle is a habitat specialist and spends almost its entire life history on the sole host plant, elderberry shrubs *(Sambucus* spp.). The species is dependent on the elderberry plant for larval and adult life stages. Elderberries are an important component of riparian ecosystems in California. Within the range of the species, habitats range from lowland riparian forest to foothill oak woodlands. It has occasionally been found with these plants in more upland habitats, including scrubland and chaparral habitats. The presumed historical range is now believed to extend from Shasta County to Madera County below 500 feet in elevation (152.4 meters) (79 FR 55874), with the current range including the Central Valley and adjoining foothills below 500 feet in elevation from approximately Shasta County in the north to Fresno County in the south (Service 2017). Historically, the riparian forests in the Central Valley consisted of several canopy layers with a dense undergrowth and included Fremont cottonwood (*Populus fremontii*), California sycamore (*Platanus racemosa*), willows (*Salix* sp.), valley oak (*Quercus lobata*), box elder (*Acer negundo* var. *californicum*), Oregon ash (*Fraxinus latifolia*), and several species of vines (e.g., California grape [*Vitis californica*] and poison oak [*Toxicodendron diversilobum*]). These plant communities encompass several remaining natural and semi-natural floristic vegetation alliances and associations in the Great Valley Ecoregion of California. Elderberry shrubs have been found most frequently in mixed plant communities, and in several types of habitat, including non-riparian locations, as both an understory and overstory plant, with valley elderberry longhorn beetle adults and exit holes created by the valley elderberry longhorn beetle found most commonly in riparian woodlands and savannas. The species uses moist valley oak woodlands suitable for elderberry plants. Shrub characteristics and other environmental factors appear to have an influence on use by the valley elderberry longhorn beetle in some recent studies, with more exit holes in shrubs in riparian than non-riparian scrub habitat types (USFWS 1984; 79 FR 55874).

The valley elderberry longhorn beetle reproduces through oviparity, with females laying eggs on leaves of the host plant. Females lay eggs singly; the number of eggs are varied, ranging from 8 to 110 in a laboratory setting. In one study, a total of 136 larvae (and an additional 44 eggs that did not hatch) were produced by one captive female valley elderberry longhorn beetle. Hatching success has been estimated at 50 to 67 percent of eggs laid, but survival rates of larvae are unknown. Females lay eggs on elderberry leaves and at the junction of leaf stalks and main stems, with all eggs laid on new growth at the outer tips of elderberry branches. Based on observations of females along the Kings River, females laid eggs at locations on the elderberry branch where the probing ovipositor (i.e., the female's egg-laying organ) could be inserted. In a laboratory setting, the majority of eggs laid were attached to leaves and stems of foliage (provided as food), with a preference for leaf petiole-stem junctions, leaf veins, and other areas containing crevices and depressions. Eggs are approximately 2.3 to 3.0 mm (0.09 to 0.12 in.) long and reddish-brown in color, with longitudinal ridges. Eggs are initially white to bright yellow, then darken to brownish white and reddish (79 FR 55874; USFWS 1984; USFWS 2006). Individuals are very dependent on their host plant. The first instars larvae bore to the center of elderberry stems, where they develop and feed on the pith. Prior to forming their pupae, the larvae chew through the bark and then plug the holes with wood shavings. The larvae crawl back to their pupal chamber, which they pack with grass. In the pupal chamber, the larvae metamorphose into their pupae and then into adults, whereupon they emerge between mid-March and mid-June (peak late April to mid- May) and breed. The short adult life stage, including breeding, coincides with the bloom period of the elderberry. The species needs woodland habitat suitable for growing elderberry plants for reproduction. Oviposition occurs on stems with diameters greater than about 2.5 cm (1 in.). The larval stage reportedly often takes 2 years inside the host plant; however, a 1-year cycle has been observed in a laboratory setting. Adults live from a few days to a few weeks after emergence and die within 3 months (79 FR 55874; USFWS 1984; USFWS 2006).

The valley elderberry longhorn beetle is an herbivorous specialist that feeds almost exclusively on blue elderberry (*Sambucus cerulea*) throughout all stages of its life. Adults feed on the foliage and perhaps flowers (and nectar) of the host plant, which are present from March through early June. Larvae feed on the pith, and emergence of the adult beetle from the pith of the host is synchronized with the host plant bloom period. The species' food resources are limited in distribution. Adults are active from March until June, while larvae are active year-round. California elderberry longhorn beetle (*D. c. californicus*) may compete with Valley elderberry longhorn beetle, because they can share food sources and their ranges can overlap. The species may also be preyed upon by insectivorous birds, lizards, European earwigs (*Forficula auricularia*), and Argentine ants (*Linepithema humile*). The species is entirely dependent on elderberry for feeding and requires the riparian moist woodlands in which the plant grows. To serve as habitat, the shrubs apparently must have stems 2.5 cm (1 in.) or greater in diameter at ground level, so that larvae may bore into them (79 FR 55874; USFWS 1984; USFWS 2006).

The valley elderberry longhorn beetle has very limited dispersal; it usually stays on or near the host plant for the duration of its life. Dispersal distance of an adult valley elderberry longhorn beetle from its emergent site is estimated to be 50 m (164 ft.) or less (USFWS 1984; 79 FR 55874).

Population Status

Rangewide Status of the Species

Although the entire historical distribution of the valley elderberry longhorn beetle is unknown, extensive destruction of riparian forests of the Central Valley during the past 150 years strongly suggests that the beetle's range has decreased and become greatly fragmented. Museum records indicate that the beetle has been collected in four central California counties: Merced, Sacramento, Solano, and Yolo (USFWS 1984).

When the valley elderberry longhorn beetle was listed in 1980, it was known from 10 occurrence records at three locations: the Merced River (Merced County), the American River (Sacramento County), and Putah Creek (Yolo County) of the Central Valley of California. Subsequent surveys throughout the Central Valley discovered more locations and the currently presumed historical range is now believed to extend from Shasta County to Madera County below 500 feet in elevation (152.4 meters) (79 FR 55874). Although different ranges for the beetle have been proposed in the past, the current presumed range relies only on verifiable sightings or specimens of adult male Valley elderberry longhorn beetles (79 FR 55874). Previous iterations of the presumed range used both female sightings and exit holes to determine Valley elderberry longhorn beetle presence. Both of these metrics are unreliable as female California elderberry longhorn beetle (*Desmocerus californicus californicus*) and Valley elderberry longhorn beetles are indistinguishable in the field and exit holes cannot be accurately assigned to either species (USFWS 2019).

Population Summary

Occupancy of the valley elderberry longhorn beetle within the presumed historical range over the past 16 years has occurred in approximately 18 hydrologic units and 36 geographical locations in the Central

Valley. The overall trend of valley elderberry longhorn beetle occupancy was moderately downward when comparing the 1991 and 1997 survey data. The species trend is an overall decline of approximately 90 percent since the 1800s (79 FR 55874). With regard to population size, no true estimates have been made due to the cryptic nature of the species. Based on a spatial analysis of valley elderberry longhorn beetle populations in the Central Valley, Talley concluded that the several-hundred-meter distances observed between local aggregations of the species support a limited migration distance for this species. An integrative approach to all three spatial frameworks (patch, gradient, and hierarchical) best defined a population structure for the valley elderberry longhorn beetle. This population structure can be characterized as patchy-dynamic, with regional distributions made up of local aggregations of populations. These localized populations are defined by both broad-scale or continuous factors associated with elderberry shrubs (e.g., shrub age or densities) and environmental variables associated with riparian ecosystems (e.g., elevation, associated trees) that themselves have patch, gradient, and hierarchical structures (79 FR 55874).

Threats

Threats to this species include:

- A significant amount of riparian vegetation (of which a portion contained elderberry shrubs) has been converted to agriculture and urban development since the mid-1800s. Agricultural development has probably reached close to its maximum extent in the Central Valley. However, conversion of agricultural lands into urban development continues at a significant rate, and as a consequence continues to affect beetle habitat by eliminating elderberries along irrigation channels and hedgerows, eliminating the buffering effect, and precluding the potential to restore riparian forest vegetation (79 FR 55874).
- Projects that may have impacted, or could impact, valley elderberry longhorn beetle habitat include: levee construction; bank protection; channelization; facility improvements or ongoing maintenance activities, including clearing and snagging; construction of bypasses; and construction of ancillary features (such as overflow weirs and outfall gates).
- Average temperatures have been rising in the Central Valley of California, and this trend will likely continue because of climate change. Climate change may also affect precipitation and the severity, duration, or periodicity of drought.
- Invasive nonnative plants may be impacting the species through modification or loss of habitat due to competition for space and resources with its host plant, but additional information is needed to evaluate the magnitude of this threat.
- The invasive, nonnative Argentine ant (*Linepithema humile*) has been identified as a potential threat to the valley elderberry longhorn beetle. This ant is both an aggressive competitor with, and predator on, several species of native fauna; it is spreading throughout California riparian areas and displacing assemblages of native arthropods. Although additional studies are needed to better characterize the level of predation threat to the valley elderberry longhorn beetle from Argentine ants, the best available data indicate that this invasive species is a predation threat to the valley elderberry longhorn beetle, and is likely to expand to additional areas within the range of the valley elderberry longhorn beetle in the foreseeable future (79 FR 55874).
- While State and federal laws provide some degree of protection for riparian vegetation and valley elderberry longhorn beetles, other types of local zoning or changes in open space designations in the future could affect the beetle (79 FR 55874).

Many pesticides are commonly used in the valley elderberry longhorn beetle's range. These pesticides include insecticides (most of which are broad-spectrum and likely toxic to the beetle) and herbicides (which may harm or kill its elderberry host plants).

Five-Year Status Review

On September 26, 2009, a 5-year status review was conducted for the Valley elderberry longhorn beetle (USFWS 2006). The USFWS concluded that the delisting of the species was given a reclassification number of "2" indicating that it is an unpetitioned action with a high management impact. On September 17, 2014, the USFWS withdrew the proposed rule to remove the Valley elderberry longhorn beetle from the Federal List of Endangered and Threatened Wildlife under the Endangered Species Act of 1973, as amended (79 FR 55874).

Recovery Plan Information

On June 28, 1984, the USFWS issued the Recovery Plan for the Valley elderberry longhorn beetle (USFWS 1984). On October 4, 2019, the USFWS issued the Revised Recovery Plan for the Valley elderberry longhorn beetle (USFWS 2019).

Recovery Actions

- Acquire, enhance, restore, and protect suitable habitat for the Valley elderberry longhorn beetle. This action involves land acquisition, habitat management, and site improvements.
- Develop management and monitoring plans for protected riparian areas that consider the threats and needs of the Valley elderberry longhorn beetle. Plans should include status and demographic monitoring, non-native predator control, habitat enhancement, and other needed activities that may increase the resilience of the Valley elderberry longhorn beetle.
- Include Valley elderberry longhorn beetle conservation as a component of state and local programs to protect riparian habitat.
- Complete studies that focus on: habitat patch size, elderberry density, and connectivity that influence the viability of individual Valley elderberry beetle populations; influences on demography and reproductive rates of the Valley elderberry longhorn beetle; and factors that influence or limit adult dispersal.
- Conduct surveys for the Valley elderberry longhorn beetle in each HUC8 subbasin to monitor and assess the health of known populations and to locate new populations.

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Crustaceans

Conservancy Fairy Shrimp

Listing Status

The Conservancy fairy shrimp was listed as endangered on September 19, 1994 (59 FR 48136). Critical habitat was designated for the Conservancy fairy shrimp on February 10, 2006 (71 FR 7118).

Life History and Habitat

The species is typically associated with large, clay-bottomed vernal pool playas with turbid water (Vollmar 2002); however, three pools in Butte Co. and two pools in Solano Co. at the Montezuma wetlands are atypical because they are relatively small in area and have very low turbidity (Vollmar 2002). This species occupies clay-bottomed vernal pools and vernal lakes, Tuscan and Merhten geological formations, and on Basin Rim landforms. The environmental specificity is very narrow; it is ecologically dependent on the presence or absence and duration of water during specific times of the year, as well as water chemistry (NatureServe 2015). They have been observed in vernal pools ranging in size from 30 to 356,253 square meters (323 to 3,834,675 square feet) (Helm 1998). Conservancy fairy shrimp have been found at elevations ranging from 5 to 1,700 meters (16 to 5,577 feet) (Eriksen and Belk 1999). The species has been found at sites that are low in alkalinity (16 to 47 parts per million) and total dissolved solids (20 to 60 parts per million), with pH near 7 (Eriksen and Belk 1999) (USFWS 2005).

The eggs are dropped from the brooding female to the benthos. The eggs hatch when the vernal pools and swales fill with rainwater and the immature stages rapidly develop into adults. Conservancy fairy shrimp hatch out of tiny cysts within the soil during the first winter rains, and complete their entire lifecycle by early summer (USFWS 2012). Other life history characteristics include mean days to mature (36.5), mean days to reproduce (46.2), and mean population longevity in days (113.9) (Helm 1998, NatureServe 2015).

This species is a detritivore and an invertivore (NatureServe 2015).

Population Status

Rangewide Status of the Species

Conservancy fairy shrimp are endemic to vernal pools in California (USFWS 2012). Its current range is restricted to the California Great Central Valley with one outlying population in Ventura County in the Interior Coast Ranges (Erikson and Belk 1999, NatureServe 2015).

Population Summary

This species has experienced a long-term population trend of a decline < 30% to an increase of 25%. The short-term population trend is stable. It is known in areas spanning a north-south distance of 300 km, but disjunct within this range (NatureServe 2015). This species is only known to occur in ten disjunct populations (USFWS 2012).

Conservancy fairy shrimp are rare, and at the time of listing, six widely separated populations (i.e., clusters of localities) of this species were known (59 FR 48136). The status of one of these six populations is unknown. This particular population was described as being located "south of Chico, Tehama County". Tehama County is actually north of Chico, and this population was not discussed in either the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Recovery Plan) (USFWS 2005), or in the first 5-year review for this species (USFWS 2007). Therefore, this population was not addressed further in the second 5-year review (USFWS 2012). Extensive surveys for fairy shrimp throughout the range of Conservancy fairy shrimp have located five additional populations since the species was listed in 1994. Currently, the Service is aware of 10 populations of Conservancy fairy shrimp, which include (from north to south): (1) Vina Plains, Butte and Tehama counties; (2) Sacramento National Wildlife Refuge (NWR), Glenn County; (3) Mariner Ranch, Placer County; (4) Yolo Bypass Wildlife Area, Yolo County; (5) Jepson Prairie, Solano County; (6) Mapes Ranch, Stanislaus County; (7) University of California (U.C.) Merced area, Merced County; (8) the Highway 165 area, Merced County; (9) Sandy Mush Road, Merced County; and (10) Los Padres National Forest, Ventura County (USFWS 2012).

As described in the first 5-year review (USFWS 2007), Conservancy fairy shrimp were reported at Beale Air Force Base (Beale) in Yuba County in 1991. The specimens collected at Beale were later identified as vernal pool fairy shrimp (C. Rogers, EcoAnalysts, Inc., pers. comm. 2007 in USFWS 2012). Extensive surveys for vernal pool crustaceans have been conducted at Beale since 1991, and no additional Conservancy fairy shrimp have been detected (Kirsten Christopherson, Beale, pers. comm. 2012 In USFWS 2012). For these reasons, Conservancy fairy shrimp are not believed to occur at Beale or in Yuba County at this time (USFWS 2012).

Threats

Threats to this species include:

- The primary threats are elimination and degradation of vernal pool habitat in the Central Valley area by urban development, water supply and flood control activities, and conversion of wildlands to agricultural use.
- Climate change is expected to have an effect on vernal pool hydrology through changes in the amount and timing of precipitation inputs to vernal pools and the rate of loss through evaporation and evapotranspiration; and these changes in hydrology will likely affect fairy shrimp species because they are obligate aquatic organisms with life histories dependent on certain hydrologic conditions.
- Non-native herbaceous species occur commonly in vernal pool complexes and have become a threat to native vernal pool species through their capacity to change pool hydrology. It is likely that the lack of fires, coupled with the lack of adequate grazing, has increased the densities of non-native herbaceous vegetation surrounding vernal pools, degrading the habitat (NatureServe 2015).
- It is likely that vernal pools containing Conservancy fairy shrimp have been exposed to harmful pesticides to some degree, but the current effects of contaminants on this species are not known at this time (NatureServe 2015).
- The combination of highly specialized pool type and soil characteristics makes the Conservancy fairy shrimp exceedingly rare (Vollmar 2002). This species is only known to occur in ten disjunct populations, with some populations being comprised of a single vernal pool. Such populations may be highly susceptible to extirpation due to chance events or additional environmental disturbance, such as adverse effects from changes in hydrology or temperatures due to climate change, invasive plant species, and inappropriate grazing regimes. If an extirpation event occurs in an isolated population, the opportunities for recolonization will be greatly reduced due to physical isolation from other source populations (USFWS 2012).
- Inappropriate grazing practices include complete elimination of grazing in areas where nonnative grasses dominate the uplands surrounding vernal pools, and inappropriate timing or intensity of grazing (USFWS 2012).

Five-Year Status Review

There have been two five-year status reviews for this species: one on September 24, 2007, and one on June 29, 2012. The latest five-year status review concluded that the Conservancy fairy shrimp continues to meet the definition of endangered and would remain an endangered species (USFWS 2012).

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the Conservancy fairy shrimp (USFWS 2005).

Reclassification and Delisting Criteria

In the Recovery Plan, the downlisting/delisting criteria identified for the Conservancy fairy shrimp include:

1. Habitat Protection: Accomplish habitat protection that promotes vernal pool ecosystem function sufficient to contribute to population viability of the covered species.

    1A. Suitable vernal pool habitat within each prioritized core area for the species is protected.

    1B. Species localities distributed across the species geographic range and genetic range are protected. Protection of extreme edges of populations protects the genetic differences that occur there.

    1C. Reintroduction and introductions must be carried out and meet success criteria.

    1D. Additional localities are permanently protected, if determined essential to recovery goals.

    1E. Habitat protection results in protection of hydrology essential to vernal pool ecosystem function, and monitoring indicates that hydrology that contributes to population viability has been maintained through at least one multi-year period that includes above average, average, and below average local rainfall as defined above, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

2. Adaptive Habitat Management and Monitoring.

    2A. Habitat management and monitoring plans that facilitate maintenance of vernal pool ecosystem function and population viability have been developed and implemented for all habitat protected, as previously discussed in Sections 1 (A-E).

    2B. Mechanisms are in place to provide for management in perpetuity and long-term monitoring of habitat protected in Sections 1 (A-E), as previously discussed (funding, personnel, etc.).

    2C. Monitoring indicates that ecosystem function has been maintained in the areas protected under Sections 1 (A-D) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

3. Status Surveys.

    3A. Status surveys, 5-year status reviews, and population monitoring show populations within each vernal pool region where the species occur are viable (e.g., evidence of reproduction and recruitment) and have been maintained (stable or increasing) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

3B. Status surveys, status reviews, and habitat monitoring show that threats identified during and since the listing process have been ameliorated or eliminated. Site-specific threats identified through standardized site assessments and habitat management planning also must be ameliorated or eliminated.

4. Research.

4A. Research actions necessary for recovery and conservation of the covered species have been identified (these are research actions that have not been specifically identified in the recovery actions but for which a process to develop them has been identified). Research actions (both specifically identified in the recovery actions and determined through the process) on species biology and ecology, habitat management and restoration, and methods to eliminate or ameliorate threats have been completed and incorporated into habitat protection, habitat management and monitoring, and species monitoring plans, and refinement of recovery criteria and actions.

4B. Research on genetic structure has been completed (for species where necessary – for reintroduction and introduction, seed banking) and results incorporated into habitat protection plans to ensure that within and among population genetic variation is fully representative by populations protected in the Habitat Protection section of this document, described previously in Sections 1 (A-E).

4C. Research necessary to determine appropriate parameters to measure population viability for each species have been completed.

5. Participation and Outreach.

5A. Recovery Implementation Team is established and functioning to oversee rangewide recovery efforts.

5B. Vernal Pool Regional working groups are established and functioning to oversee regional recovery efforts.

5C. Participation plans for each vernal pool region have been completed and implemented.

5D. Vernal Pool Regional working groups have developed and implemented outreach and incentive programs that develop partnerships.

Recovery Actions

- Conduct research and use results to refine recovery actions and criteria, and guide overall recovery and long-term conservation efforts (USFWS 2005).
- Develop and implement participation programs (USFWS 2005).
- Protect vernal pool habitat in the largest blocks possible from loss, fragmentation, degradation, and incompatible uses (USFWS 2005).
- Manage, restore, and monitor vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005).

- Conduct range-wide status surveys and status reviews for all species addressed in this recovery plan to determine species status and progress toward achieving recovery of listed species and long-term conservation of species of concern (USFWS 2005).

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Longhorn Fairy Shrimp

Listing Status

The longhorn fairy shrimp was listed as endangered on September 19, 1994 (59 FR 48136). Critical habitat was designated for the longhorn fairy shrimp on February 10, 2006 (71 FR 7118).

Life History and Habitat

The longhorn fairy shrimp is highly adapted to the unpredictable conditions of vernal pool ecosystems. Although the longhorn fairy shrimp is only known from a few localities, these sites contain very different types of vernal pool habitats. Longhorn fairy shrimp in the Livermore Vernal Pool Region in Contra Costa and Alameda counties live in small, clear, sandstone outcrop vernal pools. These sandstone pools are sometimes no larger than 1 m (3.3 ft.) in diameter, have a pH near neutral, and very low alkalinity and conductivity. Water temperatures in these vernal pools have been measured between 10 to 17.8 °C (50 to 64 °F). In the San Joaquin Valley and Carrizo Vernal Pool Regions, the longhorn fairy shrimp is found in clear to turbid grassland pools. These grassland pools may be as large as 62 m (203.4 ft.) in diameter. Water temperatures in the grassland vernal pools are also warmer, between 10 to 28 °C (50 to 82 °F). There is some evidence that temperatures may not be warm enough for the species to mature in the northern portions of the Central Valley. The species was most recently observed in a disturbed roadside ditch near Los Baños. Longhorn fairy shrimp have been found at elevations ranging from 23 m (75.5 ft.) in the San Joaquin Vernal Pool Region to 880.5 m (2,887 ft.) in the Carrizo Vernal Pool Region (USFWS 2007; USFWS 2012). Although longhorn fairy shrimp are adapted to variable vernal pool habitats, longhorn fairy shrimp presumably have evolved to persist under a range of variation in climatic conditions such as rainfall and drought. For population maintenance, vernal pools must last longer, on average, than the time needed for a species to reach maturity and produce viable eggs, and relatively small changes in the timing or amount of precipitation can affect population dynamics. Based on existing data, weather conditions in which vernal pool flooding promotes hatching—but in which pools dry (or become too warm) before embryos are fully developed—are expected to have the greatest negative effect on the resistance and resilience of vernal pool fairy shrimp populations as cyst banks are depleted (USFWS 2007; USFWS 2012).

Female fairy shrimp carry their eggs in a ventral brood sac. The eggs are either dropped to the pool bottom or remain in the brood sac until the mother dies and sinks. When the pool dries out, so do the eggs. Resting fairy shrimp eggs are known as cysts. The cysts remain in the dry pool bed until hatching begins in response to rains and other environmental stimuli (NatureServe 2015). The cyst bank in the soil may contain cysts from several years of breeding. Cysts can withstand extreme environmental conditions because of their protective coatings. Unless they are smashed or punctured, cysts are not digested when moved down the intestines of animals. When fairy shrimp cyst dry up, they are even more tolerant of extreme conditions and can be subjected to temperatures of up to 65 degrees Celsius (°C) (150 degrees Fahrenheit [°F]) or can be frozen for months. Cysts can also withstand near-vacuum conditions for 10 years without damage to the embryo. The cysts do not hatch until they receive proper environmental signals such as rain (Eriksen and Belk 1999). Hatching can begin in the same week that a pool starts to fill (typically in winter). Larvae of longhorn fairy shrimp hatch soon after rains fill the pools and water reaches around 10 °C (50 °F) (Eriksen and Belk 1999) The minimum time to maturity for longhorn fairy shrimp is 23 days, with an average of 43 days (USFWS 2005). Longhorn fairy shrimp have been collected from December to late April and complete their entire lifecycle by early summer (USFWS 2007). Because only one cohort of eggs is produced each year, longhorn fairy shrimp disappear before their native pools dry. Males die first and appear to be less tolerant of stressful conditions than females (Eriksen and Belk 1999).

Longhorn fairy shrimp are opportunistic filter feeders and need algae, bacteria, protozoa, rotifers, and bits of detritus present in their environments for feeding (NatureServe 2015). They can face competition from other fairy shrimp species present in their environments, although competition is limited (Eriksen and Belk 1999). Active adult longhorn fairy shrimp have been observed from the same vernal pool as versatile fairy shrimp (*Branchinecta lindahli*) and spadefoot tadpoles (Mesobatrachia) on the Carrizo Plain (USFWS 2007).

Longhorn fairy shrimp are nonmigratory and have relatively little ability to disperse on their own. Aquatic birds are the most likely agents of dispersal of longhorn fairy shrimp. Large mammals are also known to act as distributors by wallowing in dirt, getting caught in their fur, and transporting the cysts to another wallow. Also, because cysts can pass through the digestive systems, they can be ingested and then deposited in new habitats when the animal defecates. Less commonly, usual flooding and wind can also transport cysts. Certain fairy shrimp species are restricted in distribution, and adjacent soils may have different or no fairy shrimp. Pools observed year after year seem to have the same species and structural and genetic diversity (Eriksen and Belk 1999).

Population Status

Rangewide Status of the Species

The extent of the historical range or variation in vernal pool habitats in which the species occurs is not known (USFWS 2012). The distribution of the longhorn fairy shrimp may never have extended into the northern portion of the Central Valley or into southern California. Extensive surveying of vernal pool habitats in southern California has never revealed populations of longhorn fairy shrimp. However, it is likely that the longhorn fairy shrimp was once more widespread in the regions where it is currently known to occur, and in adjacent areas such as the San Joaquin Valley and Southern Sierra Foothill Vernal Pool Regions, where habitat loss has been extensive (USFWS 2007; USFWS 2012). Longhorn fairy shrimp are restricted to the Central Valley (USFWS 2012).

Longhorn fairy shrimp are extremely rare. The longhorn fairy shrimp is known from only a small number of widely separated populations (USFWS 2005). The five known populations of longhorn fairy shrimp are described in the section below titled Population Summary.

Population Summary

Population dynamics for longhorn fairy shrimp have not been investigated, and USFWS does not know of any studies that have assessed the status of cyst banks in isolated or connected pools. Monitoring has not been sufficient to quantify abundance and identify trends, but rather just presence of the species in surveyed pools. Because of the small population size of longhorn fairy shrimp, they are very susceptible to stochastic events (USFWS 2012). The current population trend is stable, but the population trend has historically varied, from a decline of 30 percent to an increase of 25 percent (NatureServe 2015). Currently, there are five known populations of longhorn fairy shrimp: (1) areas in and adjacent to the Carrizo Plain National Monument, San Luis Obispo County; (2) areas in the San Luis National Wildlife Refuge (NWR) Complex, Merced County; (3) areas in the Brushy Peak Preserve, Alameda County; (4) areas in the Vasco Caves Preserve, near the town of Byron in Contra Costa County; and (5) areas in the Alkali Sink Conservation Bank east of Mendota in Fresno County (USFWS 2012). This species was also detected in 2003 in a roadside ditch 2 miles north of Los Baños, in Merced County. Only one individual was detected in the ditch; this occurrence is considered to be an anomaly and not a sustainable population (USFWS 2012).

Threats

Threats to this species include:

- Urban development and conversion of native habitats to agriculture were noted as major threats for the longhorn fairy shrimp when it was listed as endangered in 1994. At the time of listing, the majority of known populations of this species were protected on public lands. Since the time of listing, additional localities have been detected that are in the same populations as those previously known, but not all of them are on protected land. A new population was detected in Fresno County in an area that is currently being proposed as a conservation bank for vernal pool species. The number of unprotected localities has increased considerably since the previous 5-year review. At this time, there are 20 unprotected localities of longhorn fairy shrimp within portions of the Carrizo Plain population (USFWS 2012). These localities occur on privately owned parcels that are about 20 acres in size.
- Stochastic extinction occurs as a result of random or unpredictable disturbances and is a continued threat to the longhorn fairy shrimp due to the rarity of the species. Localities or entire populations may be highly susceptible to extirpation due to stochastic events, such as a series of prolonged catastrophic droughts; or additional environmental disturbances, such as adverse effects from adjacent development or agriculture activities, altered hydrology due to climate change, invasive plant species, or inappropriate grazing regimes. If a catastrophic extirpation event occurs in any locality, the opportunities for re-colonization from other source localities within that population may be reduced, with long-term impacts to the abundance and sustainability of longhorn fairy shrimp in that population. More importantly, populations with a limited number of localities could be extirpated entirely. The U.S. Fish and Wildlife Service (USFWS) considers the loss of long-term viability in any one of the five extant populations a serious threat the species' recovery (USFWS 2012).
- Non-native herbaceous species occur commonly in vernal pool complexes and have become a threat to native vernal pool species through their capacity to change pool hydrology. It is likely that the lack of fires, coupled with the lack of adequate grazing, has increased the densities of non-native herbaceous vegetation surrounding vernal pools, degrading the habitat (NatureServe 2015).
- Longhorn fairy shrimp are dependent on vernal pools that have sufficient water to remain wet throughout the annual reproductive phase of the species. Climate change is expected to change hydrologic conditions in some parts of California. In addition, climate change is expected to influence the amount and timing of precipitation inputs to vernal pools and the rate of loss through evaporation and evapotranspiration, which may result in negative effects to vernal pool crustacean species through altered vernal pool hydrology.

Five-Year Status Review

There have been three five-year status reviews for this species: one on September 28, 2007, one on June 20, 2012, and one on September 2, 2022. The latest five-year status review concluded that the longhorn fairy shrimp continues to meet the definition of endangered and remains an endangered species (USFWS 2022).

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the longhorn fairy shrimp (USFWS 2005).

Reclassification and Delisting Criteria

In the Recovery Plan, the downlisting/delisting criteria identified for the Conservancy fairy shrimp include:

1. Habitat Protection: Accomplish habitat protection that promotes vernal pool ecosystem function sufficient to contribute to population viability of the covered species.

    1A. Suitable vernal pool habitat within each prioritized core area for the species is protected.

    1B. Species localities distributed across the species geographic range and genetic range are protected. Protection of extreme edges of populations protects the genetic differences that occur there.

    1C. Reintroduction and introductions must be carried out and meet success criteria.

    1D. Additional localities are permanently protected, if determined essential to recovery goals.

    1E. Habitat protection results in protection of hydrology essential to vernal pool ecosystem function, and monitoring indicates that hydrology that contributes to population viability has been maintained through at least one multi-year period that includes above average, average, and below average local rainfall as defined above, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

2. Adaptive Habitat Management and Monitoring.

    2A. Habitat management and monitoring plans that facilitate maintenance of vernal pool ecosystem function and population viability have been developed and implemented for all habitat protected, as previously discussed in Sections 1 (A-E).

    2B. Mechanisms are in place to provide for management in perpetuity and long-term monitoring of habitat protected in Sections 1 (A-E), as previously discussed (funding, personnel, etc.).

    2C. Monitoring indicates that ecosystem function has been maintained in the areas protected under Sections 1 (A-D) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

3. Status Surveys.

    3A. Status surveys, 5-year status reviews, and population monitoring show populations within each vernal pool region where the species occur are viable (e.g., evidence of reproduction and recruitment) and have been maintained (stable or increasing) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

    3B. Status surveys, status reviews, and habitat monitoring show that threats identified during and since the listing process have been ameliorated or eliminated. Site-specific threats identified through standardized site assessments and habitat management planning also must be ameliorated or eliminated.

4. Research.

4A. Research actions necessary for recovery and conservation of the covered species have been identified (these are research actions that have not been specifically identified in the recovery actions but for which a process to develop them has been identified). Research actions (both specifically identified in the recovery actions and determined through the process) on species biology and ecology, habitat management and restoration, and methods to eliminate or ameliorate threats have been completed and incorporated into habitat protection, habitat management and monitoring, and species monitoring plans, and refinement of recovery criteria and actions.

4B. Research on genetic structure has been completed (for species where necessary – for reintroduction and introduction, seed banking) and results incorporated into habitat protection plans to ensure that within and among population genetic variation is fully representative by populations protected in the Habitat Protection section of this document, described previously in Sections 1 (A-E).

4C. Research necessary to determine appropriate parameters to measure population viability for each species have been completed.

5. Participation and Outreach.

5A. Recovery Implementation Team is established and functioning to oversee rangewide recovery efforts.

5B. Vernal Pool Regional working groups are established and functioning to oversee regional recovery efforts.

5C. Participation plans for each vernal pool region have been completed and implemented.

5D. Vernal Pool Regional working groups have developed and implemented outreach and incentive programs that develop partnerships.

Recovery Actions

- Protect vernal pool habitat in the largest blocks possible from loss, fragmentation, degradation, and incompatible uses (USFWS 2005).
- Develop standardized, species-specific guidance for conducting range-wide status surveys for all species addressed in the 2005 Recovery Plan for Vernal Pool Ecosystems of California (USFWS 2005).
- Manage, restore, and monitor vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005).
- Conduct research on species addressed in the 2005 Recovery Plan for Vernal Pool Ecosystems of California (USFWS 2005).
- Develop and implement participation programs (USFWS 2005).
- Protection of the known occurrences on private lands in the Carrizo Plain core areas and the currently unprotected Alkali Sink population should be a priority for this species (USFWS 2007, 2012).
- Develop a standardized monitoring method to identify threats and management needs, and to monitor species status and population trends at the Carrizo Plain, San Luis NWR, Vasco Caves Preserve, and Brushy Peak Preserve populations (USFWS 2007, 2012).
- Management and monitoring plans should be prepared for the San Luis NWR Complex and developed for the Alkali Sink conservation bank, the only longhorn fairy shrimp locations remaining without completed management plans. Results from standardized monitoring

discussed above, above, should be included in the management plans for all five populations (USFWS 2007, 2012).

- In addition, the following research should be prioritized over the next 5 years: a. Conduct surveys on private lands with a high potential for supporting longhorn fairy shrimp, particularly in areas south of the Brushy Peak and Vasco Caves Preserves and north of the Carrizo Plain, along the western side of the Central Valley; b. Conduct surveys in the area of the Alkali Sink conservation bank; c. Conduct surveys, in the vicinity of Miller Road, north of Los Baños, Merced County, to determine whether or not the single longhorn fairy shrimp found in a road-side ditch represents a self-sustaining population, or represents an anomaly; and, d. Conduct research on vernal pool habitat restoration and longhorn fairy shrimp reintroduction methods to determine the feasibility of introducing longhorn fairy shrimp to biologically appropriate vernal pool regions and soil types (USFWS 2007, 2012).
- Regional vernal pool working groups should be created in regions where longhorn fairy shrimp are known to occur (USFWS 2007, 2012).

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Riverside Fairy Shrimp

Listing Status

Riverside fairy shrimp was federally listed as endangered on August 3, 1993, due to habitat loss and degradation due to urban and agricultural development, livestock grazing, off-road vehicle use, trampling, invasion from weedy non-native plants, and other factors (58 FR 41384). Critical habitat was designated on December 4, 2012 (77 FR 72070).

Life History and Habitat

The Riverside fairy shrimp is a small (0.56-0.92 inch) aquatic crustacean in the order Anostraca. The species is generally restricted to vernal pools and other non-vegetated ephemeral (i.e., lasting a short time) pools in Ventura, Riverside, Orange, and San Diego counties of southern California (Service 2021). Vernal pools and vernal swales are often clustered into pool "complexes," and may form dense, interconnected mosaics of small pools, or a sparse scattering of larger pools. Vernal pool complexes that support from one up to many distinct vernal pools are often interconnected by a shared watershed. Both the pool basin and the surrounding watershed are essential for a functioning vernal pool system (Service 2021). The loss of upland vegetation, increased overland water flow due to urban runoff, and alteration of the microtopography can modify the function of vernal pool systems and alter the physiochemical parameters that the Riverside fairy shrimp requires for survival. Because the Riverside fairy shrimp requires ephemerally ponded areas for its conservation, vernal pools are best described from a watershed perspective (Service 2021).

Population Status

Riverside fairy shrimp occurs in 40 vernal pool locations or complexes, including one in Ventura County, five in Orange County, 14 in Riverside County, and 20 in San Diego County (Service 2021). In the 2008 5-year review, we estimated that approximately 45 vernal pool complexes were occupied by Riverside fairy shrimp (Service 2021). The new estimate should not be interpreted as a decrease in the total number of vernal pools or complexes occupied by Riverside fairy shrimp from 2008 to 2021 because of differences in the way pool complexes and occupied habitat have been mapped and tabulated. In fact, we estimate that there are up to nine newly documented Riverside fairy shrimp locations relative to the 2008 review (known as: Tierra Rejada, Fairview Park, Wickerd Road, Lake Skinner Investor, Lake Skinner Multi-Species Reserve, Santa Rosa Plateau, French Valley Donation, Southwest Village Development, and Dennery West) (Service 2021).

Habitat loss and indirect effects from development and fragmentation are ongoing threats but impacts to the species have been reduced in part by the conservation implemented at many locations through regional Habitat Conservation Plans (e.g., City of San Diego Vernal Pool Habitat Conservation Plan and Western Riverside Multiple Species Habitat Conservation Plan). Nonnative plants continue to threaten Riverside fairy shrimp by degrading habitat such that the environmental conditions at some locations may no longer support the species (e.g., expansion of nonnative plants may cause pools to dry more quickly and no longer support the inundation duration needed for Riverside fairy shrimp) (Service 2021).

While Riverside fairy shrimp is protected by the Act, alteration of hydrology remains a threat to the species that was formerly ameliorated to some degree through the implementation of Section 404 of the Clean Water Act. Regulatory changes have eliminated U.S. Army Corps of Engineers oversight of vernal pools and other ephemeral water bodies unless they meet a narrow definition of an adjacent wetland (i.e., water bodies that have a surface connection to a navigable water or territorial sea through flooding in a typical year). Therefore, the Clean Water Act provides less protection against alterations in vernal pools and ephemeral water bodies that may support Riverside fairy shrimp (Service 2021).

Recovery Plan Information

A recovery plan for Riverside fairy shrimp and other vernal pool species was released on September 3, 1998 (Service1998) and a clarification to this plan was released on October 1, 2019 (Service 2019). The delisting criteria include the following:

1) All 74 geographic areas and associated vernal pool complexes as identified in Appendices F and G of the 1998 Recovery Plan under each of the specific management areas are protected and managed to ensure long-term viability.
2) The Service must determine that the following factors are no longer present, or continue to adversely affect, Riverside fairy shrimp: (a) the present or threatened destruction, modification, or curtailment of their habitat range; (b) over utilization for commercial, recreational, scientific, or educational purposes; (c) disease or predation; (d) the inadequacy of existing regulatory mechanisms; and (e) other natural and manmade factors affecting their continued existence.
3) Population trends continue to be stable or increasing for 10 consecutive years after threats have been sufficiently ameliorated or managed completion of delisting criterion 2 prior to consideration for delisting.

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[Service] U.S. Fish and Wildlife Service. 2021. Five-year review: Riverside fairy shrimp (*Streptocephalus woottoni*) 19 pp.

San Diego Fairy Shrimp

Listing Status

San Diego fairy shrimp was federally listed as endangered on February 3, 1997, due to habitat destruction and fragmentation from urban development and agricultural conversion, alterations of vernal pool hydrology, off-road vehicle activity, and livestock overgrazing (62 FR 4925). Critical habitat was designated on December 12, 2007 (72 FR 70648).

Life History and Habitat

The San Diego fairy shrimp is a small aquatic crustacean that feeds on algae, diatoms, and particulate organic matter (Parsick 2002) It is generally restricted to vernal pools and other non-vegetated ephemeral (i.e., containing water a short time) basins 2 to 12 inches in depth in coastal southern California and northwestern Baja California, Mexico (Simovich and Fugate 1992; Hathaway and Simovich 1996). San Diego fairy shrimp are usually observed from January to March when seasonal rainfall fills vernal pools and initiates cyst (egg) hatching. Vernal pools and vernal swales are often clustered into pool "complexes", and may form dense, interconnected mosaics of small pools, or a sparse scattering of larger pools. Vernal pool complexes that support from one up to many distinct vernal pools are often interconnected by a shared watershed. Both the pool basin and the surrounding watershed are essential for a functioning vernal pool system. Loss of upland vegetation, increased overland water flow due to urban runoff, and alteration of the microtopography can modify the function of vernal pool systems, and alter the physiochemical parameters that the San Diego fairy shrimp requires for survival. Because the San Diego fairy shrimp requires ephemerally ponded areas for its conservation, vernal pools are best described from a watershed perspective (Service 2021). San Diego fairy shrimp cysts cannot hatch in perennial (i.e., containing water year round) basins because the re-wetting of dried cysts is one component of a set of environmental stimuli that trigger hatching (Eriksen and Belk 1999) (temperature is another important cue; water chemistry and other factors may also play a role (Eriksen and Belk 1999; Hathaway and Simovich 1996; Simovich and Hathaway 1997)). Individuals hatch and mature within 7 to 14 days of rainfall filling a pool depending on water temperature (Hathaway and Simovich 1996; Simovich and Hathaway 1997). This hatching period may be extended in years with early or late rainfall. Cysts produced from successful reproduction are either dropped to the pool bottom or remain in the brood sac until the female dies and sinks. Cysts are capable of withstanding temperature extremes and prolonged drying. Only a portion of the cysts may hatch when pools refill in the same or subsequent rainy seasons; therefore, cyst "banks" develop in pool soils that are composed of cysts from several years of breeding. This partial hatching of cysts allows the San Diego fairy shrimp to persist in its extremely variable environment, since pools commonly fill and dry before hatched individuals can reproduce, and if all cysts hatched during an insufficient filling the species could be extirpated from a pool (Philippi et al. 2001, Simovich 2005, Simovich and Hathaway 1997). The ability of San Diego fairy shrimp to develop and maintain cyst banks is vital to the long-term survival of San Diego fairy shrimp populations (Ripley et al. 2004, Simovich 2005).

Population Status

There are 51 occurrences of San Diego fairy shrimp that are extant or presumed extant. Since the last status review was conducted in 2008, the distribution of San Diego fairy shrimp has expanded to include one location in Riverside County, where the species was not known to occur previously. This is the first detection of San Diego fairy shrimp east of the coastal range in southern California. Otherwise, the distribution of San Diego fairy shrimp at the county level in the United States has not changed since 2008. The species continues to occur throughout its historic range in San Diego County and Orange County, California. The species was considered extant at two locations in Mexico at the time of listing, known from the general areas of Baja Mar and Valle de las Palmas, but the status of the species at these Mexico locations is unknown (Service 2021).

The magnitude of the threat of development and its associated indirect effects has been reduced through conservation. Conserved lands are areas designated for conservation or are unlikely to be developed due to their inclusion in regional conservation plans, lands conserved by non-profits, and public or quasi-public lands. For example, regional conservation plans include the Southern Subregion and Central/Coastal Habitat Conservation Plans in Orange County and Western Riverside Multiple Species Habitat Conservation Plan (Service 2021).

Off-highway vehicles and human access continue to be threats throughout the range of the species, although fencing to preclude access has occurred at some locations. Non-native plants continue to threaten the species by degrading suitable habitat, and while conservation actions at some locations have alleviated this threat to some degree, it is likely to remain a habitat management challenge in southern California. The threat of habitat fragmentation and the resulting alteration of population dynamics remains due to ongoing development throughout the species range (Service 2021).

Hybridization and competition with *Branchinecta lindahli* may affect San Diego fairy shrimp locations throughout the range of the species. The magnitude of the threat of hybridization and competition, and the ability to manage it, is still being evaluated. Because we understand that *B. lindahli* and hybrids dominate highly disturbed pools (e.g., road ruts), conservation actions should be focused on these degraded habitats, and considerations should be made about whether landowners should remove such features, especially where they exist near intact coastal vernal pools supporting San Diego fairy shrimp. In addition, conservation partners throughout the range of San Diego fairy shrimp should continue to take all necessary precautions to prevent the spread of *B. lindahli* through contaminated equipment and movement of soil (Service 2021).

In addition, a new potential threat of disease has been identified for San Diego fairy shrimp. Wolbachia or similar bacteria can induce cytoplasmic incompatibility. These types of bacteria can also lead to biased sex ratios, parthenogenesis (female asexual reproduction), feminization of males, and a high juvenile male mortality. Because *B. lindahli* can harbor feminizing endoparasitic bacteria, hybridization with San Diego fairy shrimp may lead to genetic and reproduction issues for the listed entity (Service 2021).

While San Diego fairy shrimp is protected by the Act, alteration of hydrology remains a threat to the species that was formerly ameliorated to some degree through the implementation of Section 404 of the Clean Water Act. Regulatory changes have eliminated U.S. Army Corps of Engineers oversight of vernal pools and other ephemeral water bodies unless they meet a narrow definition of an adjacent wetland (i.e., water bodies that have a surface connection to a navigable water or territorial sea through flooding in a typical year). Therefore, San Diego fairy shrimp are more at risk due to alterations in the hydrology of vernal pools and ephemeral water bodies (Service 2021).

Recovery Plan Information

A recovery plan for San Diego fairy shrimp and other vernal pool species was released on September 3, 1998 (Service 1998) and a clarification to this plan was released on October 1, 2019 (Service 2019). The delisting criteria include the following:

1) All 74 geographic areas and associated vernal pool complexes as identified in Appendices F and G of the 1998 Recovery Plan under each of the specific management areas are protected and managed to ensure long-term viability.

2) The Service must determine that the following factors are no longer present, or continue to adversely affect, San Diego fairy shrimp: (a) the present or threatened destruction, modification, or curtailment of their habitat range; (b) over utilization for commercial, recreational, scientific, or educational purposes; (c) disease or predation; (d) the inadequacy of existing regulatory mechanisms; and (e) other natural and manmade factors affecting their continued existence.
3) Population trends continue to be stable or increasing for 10 consecutive years after threats have been sufficiently ameliorated or managed completion of delisting criterion 2 prior to consideration for delisting.

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Vernal Pool Fairy Shrimp and its Critical Habitat

Listing Status

The Service listed the vernal pool fairy shrimp as threatened on September 19, 1994 (59 FR 48136).

Life History and Habitat

Physical Description

The vernal pool fairy shrimp (*Branchinecta lynchi*) is a small freshwater crustacean, varying in size from 3 to 38 millimeters (0.12 to 1.5 inches long) and belonging to an ancient order of branchiopods, the Anostraca. Like other anostracans, it has stalked compound eyes and eleven pairs of phyllopods (swimming legs that also function as gills). The vernal pool fairy shrimp is genetically distinct from other *Branchinecta* species and is distinguished by the morphology of the male's second antenna and the female's third thoracic segment (on the middle part of its body) (USFWS 2007).

Habitat

Vernal pool fairy shrimp have an ephemeral lifecycle and exist only in vernal pools or vernal pool-like habitats; the species does not occur in riverine, marine, or other permanent bodies of water. The vernal pool fairy shrimp is endemic to California and the Agate Desert of southern Oregon. It has the widest geographic range of the federally listed vernal pool crustaceans, but it is seldom abundant where found, especially where it co-occurs with other species. The vernal pool fairy shrimp occupies a variety of different vernal pool habitats, from small, clear, sandstone rock pools to large, turbid, alkaline, grassland valley floor pools (USFWS 2005). The vernal pool fairy shrimp occurs only in cool-water pools. Although the vernal pool fairy shrimp has been collected from large vernal pools, including one exceeding 10 hectares (25 acres) in area, it tends to occur primarily in smaller pools, and is most frequently found in pools measuring less than 0.02 hectare (0.05 acre) in area. The vernal pool fairy shrimp typically occurs at elevations from 10 meters (33 feet) to 1,220 meters (4,003 feet), although two sites in the Los Padres National Forest have been found to contain the species at an elevation of 1,700 meters (5,600 feet). The vernal pool fairy shrimp has been collected at water temperatures as low as 4.5°C (40°F) and has not been found in water temperatures above about 24°C (75°F). The species is typically found in pools with low to moderate amounts of salinity or total dissolved solids. Vernal pools are mostly rain-fed, resulting in low nutrient levels and dramatic daily fluctuations in pH, dissolved oxygen, and carbon dioxide. Although there are many observations of the environmental conditions where vernal pool fairy shrimp have been found, there have been no experimental studies investigating the specific habitat requirements of this species.

In Oregon, the vernal pool fairy shrimp is found in two distinct vernal pool habitats. The species occurs on alluvial fan terraces associated with Agate-Winlo soils on the Agate Desert, and in the Table Rocks area on Randcore-Shoat soils underlain by lava bedrock. These vernal pool habitats represent the northern extent of the vernal pool fairy shrimp. In the Western Riverside County and Santa Barbara vernal pool regions, the vernal pool fairy shrimp occurs on inland mesas and valleys, on weak to strongly alkaline soils. In the Los Padres National Forest in Ventura County, it is known to occur in atypical habitats that consist of vernal pools located under a Jeffrey pine (*Pinus jeffreyi*) canopy that does not possess a grass understory. In general, the vernal pool fairy shrimp has a sporadic distribution in the vernal pool complexes, with most pools being uninhabited by the species (USFWS 2007). The thermal and chemical properties of vernal pool waters are two of the primary factors affecting the distributions of specific fairy shrimp species (including the vernal pool fairy shrimp), or their appearance from year to year. Different species may appear in pools from one year to the next, depending on whether the pools fill at a different time of the year. In years with warm winter rains, vernal pool fairy shrimp do not hatch in at least a portion of their range. In years with low amounts of precipitation or atypical timing of precipitation (or in substandard habitat), vernal pool species may die off before reproducing (Eriksen and Belk 1999). In some cases, vernal pool fairy shrimp will cease to be found in pools where they were formerly found (USFWS 2007).

Taxonomy

The vernal pool fairy shrimp was first collected between 1874 and 1941, when it was described incorrectly as Colorado fairy shrimp (*Branchinecta coloradensis*). Its identity as a separate species was resolved in 1990. Subsequent genetic analysis has confirmed that the vernal pool fairy shrimp is a distinct species (USFWS 2007). The species was named in honor of James B. Lynch, a systematist of North American fairy shrimp (USFWS 2005). Vernal pool fairy shrimp closely resemble Colorado fairy shrimp (*Branchinecta coloradensis*). However, there are differences in the shape of a small mound-like feature at the base of the male's antennae, called the pulvillus. The Colorado fairy shrimp has a round pulvillus, while the vernal pool fairy shrimp's pulvillus is elongate. The vernal pool fairy shrimp can also be identified by the shape of a bulge on the distal, or more distant end, of the antennae. This bulge is smaller and less spiny on the vernal pool fairy shrimp. The female Colorado fairy shrimp's brood pouch is longer and more cylindrical than the vernal pool fairy shrimp's. Female vernal pool fairy shrimp also closely resemble female midvalley fairy shrimp. These two species can be distinguished by the number and placement of lobes on their backs, called dorsolateral thoracic protuberances. Vernal pool fairy shrimp have paired dorsolateral thoracic protuberances on the third thoracic segment that are not found in the midvalley fairy shrimp (USFWS 2005).

Current Range

Since the vernal pool fairy shrimp’s listing, surveys of vernal pools and other temporary waters throughout the western United States have resulted in an increase in the shrimp’s known range. In 1998, the shrimp was discovered in two distinct vernal pool habitats in Jackson County, Oregon. The known range of the vernal pool fairy shrimp was also extended due to its detection in one pool at the Napa Airport at the southeastern edge of the Lake-Napa Vernal Pool Region (USFWS 2007). The vernal pool fairy shrimp is currently found in 28 counties across the Central Valley and coast ranges of California, and in Jackson County in southern Oregon. The species occupies a variety of vernal pool habitats and occurs in 13 of the 17 vernal pool regions and 45 of the 85 core recovery areas identified in California and southern Oregon (USFWS 2005).

Population Status

The vernal pool fairy shrimp is much less restricted in range than other species of fairy shrimp; however, it is not abundant at any site (NatureServe 2015). Surveys (and monitoring) of vernal pool fairy shrimp generally only record presence/absence in pools and do not provide information on shrimp abundance in pools. At the time of listing in 1994, the populations represented either geographic clusters of occurrence records or single occurrences from areas with extant vernal pool habitat. The 32 extant populations were described for the following counties, with the number of populations in parentheses: Shasta County (1), Tehama County (4), Glenn County (1), Butte County (1), Yuba County (1), Placer County (1), El Dorado County (1), Sacramento County (2), Solano County (1), Contra Costs County (1), Alameda County (1), Merced County (4), Madera County (2), Fresno County (2), San Benito County (1), Tulare County (4), San Luis Obispo County (1), Santa Barbara County (1), and Riverside County (2) (USFWS 2007).

Currently, the vernal pool fairy shrimp is known from 13 vernal pool regions. At the time of listing, 178 extant occurrences were known from 32 putative populations, based on proximity of known occurrences. There are currently 795 recorded occurrences in the California Natural Diversity Database. The USFWS has information to indicate that the shrimp is still extant in most of the putative populations, although loss and fragmentation of vernal pool habitat has occurred in and around most of the 1994 populations, potentially decreasing their viability. Without species specific monitoring, the USFWS does not know whether populations of vernal pool fairy shrimp are declining (USFWS 2007).

Critical Habitat

The Service designated approximately 858,846 acres (347,563 hectares) of critical habitat for four vernal pool crustaceans and 11 vernal pool plants in 34 counties in California and one county in southern Oregon in a final rule of August 11, 2005 (70 FR 46924). That rule designated critical habitat for the 15 vernal pool species collectively. Pursuant to that rule, on February 10, 2006, the Service published species-specific unit descriptions and maps for the 15 species. This rule specifically identifies the critical habitat for each individual species identified in the August 11, 2005, final rule. Thirty-five units are designated as critical habitat for the vernal pool fairy shrimp, totaling 597,821 acres:

- Unit 1: Jackson County, Oregon. Unit 1A: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Shady Grove. Unit 1B: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Shady Grove. Unit 1C: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Shady Grove. Unit 1D: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point. Unit 1E: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Shady Grove. Unit 1F: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Shady Grove. Unit 1G: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point.
- Unit 2: Jackson County, Oregon. Unit 2A: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point. Unit 2B: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point. Unit 2C: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point. Unit 2D. Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point. Unit 2E: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point. Unit 2E: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point.
- Unit 3: Jackson County, Oregon. Unit 3A: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point. Unit 3B: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point, Sams Valley. Unit 3C: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Sams Valley.
- Unit 4: Jackson County, Oregon. Unit 4A: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Sams Valley. Unit 4B: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Sams Valley.
- Unit 5: Shasta County, California. From USGS 1:24,000 scale quadrangle Palo Cedro, Enterprise, Balls Ferry, Cottonwood.
- Unit 6: Tehama County, California. From USGS 1:24,000 scale quadrangle Red Bluff East, Red Bluff West, Gerber, West of Gerber, Corning, Henleyville.
- Unit 7: Tehama County, California. Unit 7A: Tehama County, California. From USGS 1:24,000 scale quadrangle Acorn Hollow and Richardson Springs NW. Unit 7B: Tehama County, California. From USGS 1:24,000 scale quadrangle Sloughhouse. Unit 7C: Tehama County, California. From USGS 1:24,000 scale quadrangle Richard Springs NW. Unit 7D: Tehama and Butte counties, California. From USGS 1:24,000 scale quadrangle Campbell Mound, Richardson Springs, and Richardson Springs NW. Unit 7E: Butte County, California. From USGS 1:24,000

scale quadrangle Richardson Springs. Unit 7F: Butte County, California, California. From USGS 1:24,000 scale quadrangle Richardson Springs.

- Unit 8: Tehama and Glenn counties, California. From USGS 1:24,000 scale quadrangle Kirkwood and Black Butte Dam.
- Unit 9: Butte County, California. From USGS 1:24,000 scale quadrangle Chico.
- Unit 11: Yuba County, California. From USGS 1:24,000 scale quadrangle Browns Valley and Wheatland.
- Unit 12: Placer County, California. Unit 12A: Placer County, California. From USGS 1:24,000 scale quadrangle Lincoln. Unit 12B: Placer County, California. From USGS 1:24,000 scale quadrangle Lincoln.
- Unit 13: Sacramento County, California. From USGS 1:24,000 scale quadrangle Carmichael.
- Unit 14: Sacramento and Amador County, California. Unit 14A: Sacramento and Amador County, California. From USGS 1:24,000 scale quadrangle Carbondale, Sloughhouse, Goose Creek, and Clay. Unit 14B: Sacramento County, California. From USGS 1:24,000 scale quadrangle Sloughhouse.
- Unit 16: Solano County, California. Unit 16A: Solano County, California. From USGS 1:24,000 scale quadrangle Elmira, Denverton, and Fairfield South. Unit 16B: Solano County, California. From USGS 1:24,000 scale quadrangle Elmira and Denverton. Unit 16C: Solano County, California. From USGS 1:24,000 scale quadrangle Elmira. Unit 16D: Solano County, California. From USGS 1:24,000 scale quadrangle Dozier.
- Unit 17: Napa County, California. From USGS 1:24,000 scale quadrangle Cuttings Wharf.
- Unit 18: San Joaquin County, California. From USGS 1:24,000 scale quadrangle Valley Springs SW, Linden, Farmington, and Peters.
- Unit 19: Contra Costa County, California. Unit 19A: Contra Costa County, California. From USGS 1:24,000 scale quadrangle Brentwood and Antioch South. Unit 19B: Contra Costa County, California. From USGS 1:24,000 scale quadrangle Clifton Court Forebay and Byron Hot Springs. Unit 19C: Alameda County, California. From USGS 1:24,000 scale quadrangle Altamont and Livermore.
- Unit 20: Stanislaus County, California. From USGS 1:24,000 scale quadrangle Ripon.
- Unit 21: Stanislaus County, California. Unit 21A: Stanislaus County, California. From USGS 1:24,000 scale quadrangle Paulsell and Montpelier. Unit 21B: Stanislaus, Merced, and Mariposa counties, California. From USGS 1:24,000 scale quadrangle La Grange, Cooperstown, Paulsell, Turlock Lake, Snelling, Montpelier and Merced Falls. Unit 21C: Merced County, California. From USGS 1:24,000 scale quadrangle Turlock Lake.
- Unit 22: Merced County, California. From USGS 1:24,000 scale quadrangle Merced Falls, Snelling, Indian Gulch, Haystack Mtn., Yosemite Lake, Winton, Owens Reservoir, Planada, Le Grand, Plainsburg, and Merced.

Primary Constituent Elements/Physical or Biological Features

Critical habitat units are designated for Jackson County, Oregon, and Alameda, Amador, Butte, Contra Costa, Fresno, Kings, Madera, Mariposa, Merced, Monterey, Napa, Placer, Sacramento, San Benito, San Joaquin, San Luis Obispo, Santa Barbara, Shasta, Solano, Stanislaus, Tehama, Tulare, Ventura, and Yuba Counties, California. The primary constituent elements of critical habitat for vernal pool fairy shrimp (*Branchinecta lynchi*) are the habitat components that provide:

(i) Topographic features characterized by mounds and swales and depressions within a matrix of surrounding uplands that result in complexes of continuously, or intermittently, flowing surface water in the swales connecting the pools described below in paragraph (ii), providing for dispersal and promoting hydroperiods of adequate length in the pools;

(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water for a minimum of 18 days, in all but the driest years; thereby providing adequate water for incubation, maturation, and reproduction. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands;

(iii) Sources of food, expected to be detritus occurring in the pools, contributed by overland flow from the pools' watershed, or the results of biological processes within the pools themselves, such as single-celled bacteria, algae, and dead organic matter, to provide for feeding; and

(iv) Structure within the pools described above in paragraph (ii), consisting of organic and inorganic materials, such as living and dead plants from plant species adapted to seasonally inundated environments, rocks, and other inorganic debris that may be washed, blown, or otherwise transported into the pools, that provide shelter.

Recovery Plan Information

Recovery Actions

Recovery actions for this species include the following:

- Protect vernal pool habitat in the largest blocks possible from loss, fragmentation, degradation, and incompatible uses (USFWS 2005).
- Manage, restore, and monitor vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005).
- Conduct range-wide status surveys and status reviews for all species addressed in this recovery plan to determine species status and progress toward achieving recovery of listed species and long-term conservation of species of concern (USFWS 2005).
- Conduct research and use results to refine recovery actions and criteria, and guide overall recovery and long-term conservation efforts (USFWS 2005).
- Develop and implement participation programs (USFWS 2005).
- Research: Conduct coordinated research for the vernal pool fairy shrimp that assesses the number of demographically independent units that are persisting, directly estimates levels of migration between units (to determine likelihood of recolonization), determines long- term trends in population growth, and experimentally measures probabilities of local extinction and recolonization. Research should address egg bank dynamics and trends in egg bank abundance over time. Comparisons between isolated pools, pools in fragmented habitat, pools in intact vernal pool complexes, and a variety of created pools should also be assessed. The long-term effects on the hydrology of vernal pools from development-related alterations to vernal pool sub-watersheds should be assessed. Efforts should lead to determinations of appropriate hydrology (or upland) buffers. Additional research needs include a systematic survey to update the status of known California Natural Diversity Database occurrences. The probability of detecting the species under USFWS' survey guidelines for vernal pool crustaceans should also be conducted (USFWS 2007).
- Recovery: Additional preservation of known extant occurrences is needed to reduce habitat threats and reach recovery goals outlined in the 2005 Recovery Plan. Preservation of large blocks of vernal pool habitat that contain complete or large portions of vernal pool complexes is needed for this species. USFWS should also work with private landowners for the conservation of habitat for the vernal pool fairy shrimp through conservation easements or other methods (USFWS 2007).

- Monitoring: Develop and implement a standardized formal monitoring program that collects data in sufficient detail to evaluate species status, and examine changes in population dynamics and community composition (USFWS 2007).
- Habitat Management: Develop management indicators for identifying potential problems and assessing ecosystem health as it pertains to vernal pool crustaceans. Establish requirements for appropriate management of vernal pool landscapes. Establish improved guidelines, monitoring protocols, and success criteria for appropriate management of vernal pool landscapes and constructed and restored pools (USFWS 2007).

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Vernal Pool Tadpole Shrimp and its Critical Habitat

Listing Status

The Service listed the vernal pool tadpole shrimp as endangered on September 19, 1994 (59 FR 48136).

Life History and Habitat

The vernal pool tadpole shrimp can be identified by the large, shield-like carapace that covers the anterior half of its body and the paddle-like supra-anal plate located between the paired cercopods (jointed antenna-like appendages. It feeds on both living organisms such as fairy shrimp and on detritus (Service, 2005). Vernal pool tadpole shrimp have from 30 to 35 pairs of phyllopods (swimming legs that also function as gills), a segmented abdomen, and fused eyes. Mature vernal pool tadpole shrimp range from 0.6 to 3.3 inches in length (Service, 2005).

Vernal pool tadpole shrimp generally take between three to four weeks to mature, and reproduction begins after individuals reach 0.4 inch or more in carapace length and fecundity increases with body size (Service, 2007). Large females, greater than 0.8-inch carapace length, can deposit as many as six clutches, ranging from 32 to 61 eggs per clutch, in a single wet season. The vernal pool tadpole shrimp may be hermaphroditic (individuals have both male and female reproductive organs) (Service, 2007).

The vernal pool tadpole shrimp is found only in ephemeral freshwater habitats, including alkaline pools, clay flats, vernal lakes, vernal pools, vernal swales, and other seasonal wetlands in California (Service, 2007) that contain clear to highly turbid water, with water temperatures ranging from 50 to 84 degrees Fahrenheit and pH ranging from 6.2 to 8.5. Multiple hatchings within the same wet season allow the vernal pool tadpole shrimp to persist within pools as long as these habitats remain inundated, sometimes for six months or more. Hatching of vernal pool tadpole shrimp eggs is temperature dependent. Optimal hatching occurs between 50 to 59 degrees Fahrenheit, with hatching rates becoming significantly lower at temperatures above 68 degrees Fahrenheit (Service, 2007).

Vernal pool tadpole shrimp eggs and adults are carried from one wetland to another by a variety of methods, the most important likely being overland flooding from rainstorms, and by waterfowl and other migratory birds (on the bird's feet or in its gut) (Service, 2007).

Population Status

Although vernal pool tadpole shrimp are spread over a wide geographic range, their habitat is highly fragmented and they are uncommon where they are found (Service, 2007). Several to several hundred individuals can be found in any given water body (NatureServe, 2015). At the time of listing in 1994, vernal pool tadpole shrimp were known from 18 populations, extending from east of Redding, Shasta County, southward to the San Luis NWR, Merced County, in the Central Valley, with a disjunct population at the San Francisco NWR, Alameda County (59 FR 48136). However, the precise location and extent of those populations and the number of counties occupied at that time are not known (Service, 2005). As of the last five-year review in 2007, there were 226 occurrences within 19 counties; however, the number of populations represented (species occurrences with a separation of greater than 0.25 mile.), is unknown. A given pool may support several to several hundred individuals within a given water body (NatureServe, 2015). Annual surveys have not occurred at all sites with known vernal pool tadpole shrimp occurrences. Where surveys have been conducted for vernal pool tadpole shrimp, they were designed for the purpose of determining the presence of species in the areas of proposed development or road projects, and have generally been limited in scope, focusing on a single parcel or occurrence. Surveys are generally not conducted in a manner to facilitate determination of the population trends of this species. No trends either downward or upward have been reported at any of the monitored sites; however, the accelerated loss and fragmentation of vernal pool tadpole shrimp habitat, particularly in the Southeastern Sacramento Valley Vernal Pool Region, is expected to result in markedly decreased long-term viability of this species. Populations in the Vina Plains in Tehama County may be susceptible, as described in the 1994 final rule, to decreased fecundity due to parasitization by flukes (Trematoda) of an undetermined species (Service, 2007).

Current Range

The vernal pool tadpole shrimp is currently distributed across the Central Valley of California and in the San Francisco Bay Area. The species' distribution has been greatly reduced from historical times as a result of widespread destruction and degradation of its vernal pool habitat. Vernal pool habitats in the Central Valley now represent only about 25 percent of their former area, and remaining habitats are considerably more fragmented and isolated than during historical times. Vernal pool tadpole shrimp are uncommon even where vernal pool habitats occur (Service, 2005). The vernal pool tadpole shrimp has a patchy distribution across the Central Valley of California, from Shasta County southward to northwestern Tulare County, with isolated occurrences in Alameda and Contra Costa counties. As of 2007, the California Natural Diversity Database (CNDDB) reported 226 occurrences of vernal pool tadpole shrimp in the following 19 counties: Alameda, Butte, Colusa, Contra Costa, Fresno, Glenn, Kings, Merced, Placer, Sacramento, San Joaquin, Shasta, Solano, Stanislaus, Sutter, Tehama, Tulare, Yolo, and Yuba. Sacramento County contains 28 percent, the greatest amount, of the known occurrences (Service, 2007).

Critical Habitat

The Service originally designated critical habitat for this species on August 6, 2003. On August 11, 2005, the Service re-evaluated the economic exclusions made to the previous final rule (68 FR 46684; August 6, 2003), which designated critical habitat pursuant to the Endangered Species Act of 1973, as amended (Act), for four vernal pool crustaceans and 11 vernal pool plants. A total of approximately 858,846 acres (347,563 hectares) of land are now designated critical habitat. This reflects the exclusion of lands from the final designation for economic reasons, pursuant to section 4(b)(2) of the Act. This designation also reflects the lands previously confirmed for exclusion under 4(b)(2) of the Act for noneconomic reasons (70 FR 11140; March 8, 2005). The non-economic exclusions include the boundaries of various Habitat Conservation Plans, National Wildlife Refuges and National fish hatchery lands (33,097 acres (13,394 hectares)), State lands within ecological reserves and wildlife management areas (20,933 acres (8,471 hectares)), Department of Defense lands within Beale and Travis Air Force Bases as well as Fort Hunter Liggett and Camp Roberts Army installations (64,259 acres (26,005 hectares)), Tribal lands managed by the Mechoopda Tribe (644 acres (261 hectares)), and the Santa Rosa Plateau Ecological Reserve (10,200 acres (4,128 hectares)) from the final designation.

Critical habitat for the vernal pool tadpole shrimp (*Lepidurus packardi*) in California consists of the following areas:

(1) Subunit 5A; Siskiyou County, California. From USGS 1:24,000 scale quadrangle Timbered Crater.
(2) Subunit 5B; Modoc and Shasta County, California. From USGS 1:24,000 scale quadrangle Day, Timbered Crater.
(3) Subunit 5C; Shasta County, California. From USGS 1:24,000 scale quadrangle Dana, Burney Falls.
(4) Subunit 5D; Shasta County, California. From USGS 1:24,000 scale quadrangle Burney.
(5) Subunit 5E; Shasta County, California. From USGS 1:24,000 scale quadrangle Burney.
(6) Subunit 5F; Shasta County, California. From USGS 1:24,000 scale quadrangle Merken Bench.

(7) Subunit 5G; Shasta County, California. From USGS 1:24,000 scale quadrangle Murken Bench, Old Station.
(8) Subunit 5H; Lassen County, California. From USGS 1:24,000 scale quadrangle Poison Lake, Swains Hole.
(9) Subunit 5I; Lassen and Shasta County, California. From USGS 1:24,000 scale quadrangle Swains Hole.
(10) Subunit 5J; Lassen County, California. From USGS 1:24,000 scale quadrangle Harvey Mtn., Poison Lake, Pine Creek Valley, Bogard Buttes.
(11) Subunit 5K; Shasta County, California. From USGS 1:24,000 scale quadrangle Old Station, West Prospect Peak.
(12) Subunit 5L; Plumas County, California. From USGS 1:24,000 scale quadrangle Almanor.
(13) Subunit 6A; Shasta County, California. From USGS 1:24,000 scale quadrangle Enterprise.
(14) Subunit 6B; Shasta County, California. From USGS 1:24,000 scale quadrangle Enterprise, Cottonwood.
(15) Subunit 6C; Shasta County, California. From USGS 1:24,000 scale quadrangles Balls Ferry, Cottonwood, Enterprise, and Palo Cedro.
(16) Subunit 6D; Shasta County, California. From USGS 1:24,000 scale quadrangle Palo Cedro, Balls Ferry.
(17) Subunit 6E; Tehama County, California. From USGS 1:24,000 scale quadrangle Henleyville, Corning, West of Gerber, Gerber, Red Bluff West, Red Bluff East.
(18) Subunit 6F; Glenn and Tehama counties, California. From USGS 1:24,000 scale quadrangle Black Butte Dam and Kirkwood.
(19) Subunit 7A; Shasta County, Tehama County, California. From USGS 1:24,000 scale quadrangle Balls Ferry.
(20) Subunit 7B; Shasta and Tehama County, California. From USGS 1:24,000 scale quadrangles Tuscan Buttes NE, Balls Ferry, Shingletown, Dales, Bend, Red Bluff East.
(21) Subunit 7C; Butte County, Tehama County, California. From USGS 1:24,000 scale quadrangles Acorn Hollow, Campbell Mound, Richardson Springs Northwest, and Vina.
(22) Subunit 7D; Butte County, California. From USGS 1:24,000 scale quadrangle Richardson Springs.
(23) Subunit 7E; Butte County, California. From USGS 1:24,000 scale quadrangle Richardson Springs.
(24) Subunit 7F; Butte County, California. From USGS 1:24,000 scale quadrangle Paradise West, Richardson Springs, Chico.
(25) Subunit 7G; Butte County, California. From USGS 1:24,000 scale quadrangle Hamlin Canyon, Chico.
(26) Subunit 7H; Butte County, California. From USGS 1:24,000 scale quadrangle Cherokee, Hamlin Canyon.
(27) Subunit 7I; Butte County, California. From USGS 1:24,000 scale quadrangle Hamlin Canyon, Shipee.
(28) Subunit 7J; Butte County, California. From USGS 1:24,000 scale quadrangle Cherokee, Oroville, Shippee.
(29) Subunit 7K; Butte County, California. From USGS 1:24,000 scale quadrangles Oroville, and Shippee.
(30) Subunit 7L; Butte County, California. From USGS 1:24,000 scale quadrangle Hamlin Canyon, Shippee.

(31) Subunit 7M; Butte County, California. From USGS 1:24,000 scale quadrangle Cherokee, Oroville, Shippee.
(32) Subunit 7N; Butte County, California. From USGS 1:24,000 scale quadrangle Oroville, Shippee.
(33) Subunit 8A; Mendocino County, California. From USGS 1:24,000 scale quadrangle Point Arena.
(34) Subunit 9A; Lake County, California. From USGS 1:24,000 scale quadrangle Kelseyville, The Geysers.
(35) Subunit 9B; Lake County, California. From USGS 1:24,000 scale quadrangle Middletown.
(36) Subunit 9C; Napa County, California. From USGS 1:24,000 scale quadrangle Capell Valley, Yountville.
(37) Subunit 10A; Colusa County, California. From USGS 1:24,000 scale quadrangle Meridian, Colusa.
(38) Subunit 10B; Yolo County, California. From USGS 1:24,000 scale quadrangles Davis, and Saxon.
(39) Subunit 10C; Solano County, California. From USGS 1:24,000 scale quadrangle Dozier.
(40) Subunit 10D; Solano County, California. From USGS 1:24,000 scale quadrangle Elmira.
(41) Subunit 10E; Solano County, California. From USGS 1:24,000 scale quadrangles Denverton, and Elmira.
(42) Subunit 10F; Solano County, California. From USGS 1:24,000 scale quadrangles Denverton, Elmira, and Fairfield South.
(43) Subunit 10G; Solano County, California. From USGS 1:24,000 scale quadrangle Fairfield South.
(44) Subunit 10H; Solano County, California. From USGS 1:24,000 scale quadrangle Fairfield South.
(45) Subunit 11A; Yuba County, California. From USGS 1:24,000 scale quadrangles Browns Valley, and Wheatland.
(46) Subunit 11B; Placer County, California. From USGS 1:24,000 scale quadrangle Lincoln.
(47) Subunit 11C; Placer County, California. From USGS 1:24,000 scale quadrangle Lincoln.
(48) Subunit 11D; Sacramento County, California. From USGS 1:24,000 scale quadrangle Folsom.
(49) Subunit 11E; Sacramento County, California. From USGS 1:24,000 scale quadrangle Carmichael.
(50) Subunit 11F; Sacramento County, California. From USGS 1:24,000 scale quadrangle Sloughhouse.
(51) Subunit 11G; Amador County, Sacramento County, California. From USGS 1:24,000 scale quadrangles Carbondale, Clay, Goose Creek, and Sloughhouse.
(52) Subunit 11H; Sacramento, San Joaquin County, California. From USGS 1:24,000 scale quadrangle Lockeford, Clay.
(53) Subunit 12A; Napa County, California. From USGS 1:24,000 scale quadrangle Napa, Cuttings Wharf.
(54) Subunit 12B; Napa County, California. From USGS 1:24,000 scale quadrangle Cuttings Wharf.
(55) Subunit 12C; Contra Costa County, California. From USGS 1:24,000 scale quadrangle Benicia, Mare Island.
(56) Subunit 13A; Contra Costa County, California. From USGS 1:24,000 scale quadrangle Antioch South, Brentwood.
(57) Subunit 13B; Contra Costa County, California. From USGS 1:24,000 scale quadrangle Byron Hot Springs, Clifton Court Forebay.

(58) Subunit 13C; Contra Costa County, California. From USGS 1:24,000 scale quadrangle Byron Hot Springs.
(59) Subunit 13D; Alameda County, California. From USGS 1:24,000 scale quadrangle Byron Hot Springs.
(60) Subunit 13E; Alameda County, California. From USGS 1:24,000 scale quadrangle Altamont, Livermore.
(61) Subunit 14A; Stanislaus County, California. From USGS 1:24,000 scale quadrangle Ripon.
(62) Subunit 14B; Merced County, California. From USGS 1:24,000 scale quadrangles Gustine, San Luis Ranch, and Stevinson.
(63) Subunit 14C; Merced County, California. From USGS 1:24,000 scale quadrangles San Luis Ranch, and Stevinson.
(64) Subunit 14D; Merced County, California. From USGS 1:24,000 scale quadrangles Arena, San Luis Ranch, Stevinson, and Turner Ranch.
(65) Subunit 14E; Merced County, California. From USGS 1:24,000 scale quadrangles Arena, and Turner Ranch.
(66) Subunit 14F; Merced County, California. From USGS 1:24,000 scale quadrangles Sandy Mush, and Turner Ranch.
(67) Subunit 14G; Merced County, California. From USGS 1:24,000 scale quadrangles Sandy Mush and Turner Ranch.
(68) Subunit 14H; Merced County, California. From USGS 1:24,000 scale quadrangle Sandy Mush.
(69) Subunit 14I; Merced County, California. From USGS 1:24,000 scale quadrangles El Nido, and Sandy Mush.
(70) Subunit 14J; Merced County, California. From USGS 1:24,000 scale quadrangle Sandy Mush.
(71) Subunit 14K; Merced County, California. From USGS 1:24,000 scale quadrangle El Nido.
[(89) omitted]
(90) Subunit 14L; Merced County, California. From USGS 1:24,000 scale quadrangles El Nido, and Plainsburg.
(91) Subunit 14M; Kings County and Tulare County, California. From USGS 1:24,000 scale quadrangles Burris Park, Monson, Remnoy, and Traver.
(92) Subunit 14N; Tulare County, California. From USGS 1:24,000 scale quadrangles Alpaugh, Cocoran, and Taylor Weir.
(93) Subunit 14O; Tulare County, California. From USGS 1:24,000 scale quadrangles Alpaugh, and Pixley.
(94) Subunit 14P; Tulare County, California. From USGS 1:24,000 scale quadrangles Alpaugh, and Pixley.
(95) Subunit 14Q; Tulare County, California. From USGS 1:24,000 scale quadrangle Delano West.
(96) Subunit 15A; San Joaquin County, California. From USGS 1:24,000 scale quadrangle Peters, Farmington, Linden, Valley Springs SW.
(97) Subunit 15B; Tuolumne and Stanislaus County, California. From USGS 1:24,000 scale quadrangle Keystone, Knights Ferry.
(98) Subunit 15C; Stanislaus County, California. From USGS 1:24,000 scale quadrangles Paulsell, and Waterford.
(99) Subunit 15D; Stanislaus County, California. From USGS 1:24,000 scale quadrangle Paulsell.
(100) Subunit 15E; Stanislaus County, Tuolumne County, California. From USGS 1:24,000 scale quadrangles Cooperstown, Keystone, La Grange, and Paulsell.
(101) Subunit 15F; Stanislaus County, California. From USGS 1:24,000 scale quadrangle Paulsell.

(102) Subunit 15G; Stanislaus County, California. From USGS 1:24,000 scale quadrangles Montpelier, and Paulsell.

(103) Subunit 15H; Merced County, Stanislaus County, California. From USGS 1:24,000 scale quadrangles Cooperstown, La Grange, Merced Falls, Montpelier, Paulsell, and Turlock Lake.

(104) Subunit 15I; Merced County, California. From USGS 1:24,000 scale quadrangle Turlock Lake.

(105) Subunit 15J; Madera County, Mariposa County, Merced County, California. From USGS 1:24,000 scale quadrangles Haystack Mountain, Illinois Hill, Indian Gulch, Le Grand, Merced, Merced Falls, Owens Reservoir, Plainsburg, Planada, Raynor Creek, Snelling, Winton, and Yosemite Lake.

(105) Subunit 15J; Madera County, Mariposa County, Merced County, California. From USGS 1:24,000 scale quadrangles Haystack Mountain, Illinois Hill, Indian Gulch, Le Grand, Merced, Merced Falls, Owens Reservoir, Plainsburg, Planada, Raynor Creek, Snelling, Winton, and Yosemite Lake.

(107) Subunit 15L; Fresno County, and Madera County, California. From USGS 1:24,000 scale quadrangles Daulton, Friant, Gregg, Lanes Bridge, Little Table Mountain, and Millerton Lake West.

(108) Subunit 15M; Madera County, California. From USGS 1:24,000 scale quadrangles Millerton Lake East, and North Fork.

(109) Subunit 15N; Fresno County, California. From USGS 1:24,000 scale quadrangles Academy, and Millerton Lake East.

(110) Subunit 15O; Fresno County, California. From USGS 1:24,000 scale quadrangles Academy, Friant, and Round Mountain.

(111) Subunit 15P; Fresno County, California. From USGS 1:24,000 scale quadrangle Clovis.

(112) Subunit 15Q; Fresno County, California. From USGS 1:24,000 scale quadrangle Clovis.

(113) Subunit 15R; Tulare County, California. From USGS 1:24,000 scale quadrangles Ivanhoe, and Stokes Mountain.

(114) Subunit 15S; Tulare County, California. From USGS 1:24,000 scale quadrangles Auckland, Ivanhoe, Stokes Mountain, and Woodlake.

(115) Subunit 15T; Tulare County, California. From USGS 1:24,000 scale quadrangle Woodlake.

(116) Subunit 15U; Tulare County, California. From USGS 1:24,000 scale quadrangle Monson.

(117) Subunit 15V; Tulare County, California. From USGS 1:24,000 scale quadrangle Monson.

(118) Subunit 15W; Tulare County, California. From USGS 1:24,000 scale quadrangle Monson.

(119) Subunit 16B; Alameda County, California. From USGS 1:24,000 scale quadrangle Niles, Milpitas.

(120) Subunit 17A; San Benito, Monterey counties, California. From USGS 1:24,000 scale quadrangle Llanada, San Benito, Hernandez Reservoir, Rock Springs Peak, Topo Valley, Hepsedam Peak, Lonoak, Pinalito Canyon, Monarch Peak, Nattrass Valley.

(121) Subunit 18A; Monterey County, California. From USGS 1:24,000 scale quadrangle Williams Hill, Jolon, Valleton, Bradley, San Miguel, Wunpost.

(122) Subunit 19A; Monterey County, California. From USGS 1:24,000 scale quadrangle Bradley, San Miguel, Wunpost, Valleton.

(123) Subunit 19B; Monterey, San Luis Obispo counties, California. From USGS 1:24,000 scale quadrangle Bradley.

(124) Subunit 19C; Monterey, San Luis Obispo counties, California. From USGS 1:24,000 scale quadrangle San Miguel.

(125) Subunit 19D; San Luis Obispo County, California. From USGS 1:24,000 scale quadrangle San Miguel.

(126) Subunit 19E; San Luis Obispo County, California. From USGS 1:24,000 scale quadrangle Paso Robles, and San Miguel.
(127) Subunit 19F; San Luis Obispo County, California. From USGS 1:24,000 scale quadrangle Paso Robles, Adelaida.
(128) Subunit 19G; Monterey and San Luis Obispo counties, California. From USGS 1:24,000 scale quadrangle Creston, Paso Robles, Estrella, Ranchito Canyon, Cholame Hills.
(129) Subunit 20A; San Luis Obispo, California. From USGS 1:24,000 scale quadrangle Simmler.
(130) Subunit 21A; Santa Barbara County, California. From USGS 1:24,000 scale quadrangle Santa Ynez, Lake Cachuma, Los Olivos, Figueroa Mtn.
(131) Subunit 22A; Ventura County, California. From USGS 1:24,000 scale quadrangles Alamo Mountain, Lion Canyon, Lockwood Valley, San Guillermo, and Topatopa Mountains.

Primary Constituent Elements/Physical or Biological Features

The primary constituent elements of critical habitat for vernal pool tadpole shrimp (*Lepidurus packardi*) are the habitat components that provide:

(i) Topographic features characterized by mounds and swales and depressions within a matrix of surrounding uplands that result in complexes of continuously, or intermittently, flowing surface water in the swales connecting the pools described in paragraph (ii) of this section, providing for dispersal and promoting hydroperiods of adequate length in the pools;
(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water for a minimum of 41 days, in all but the driest years; thereby providing adequate water for incubation, maturation, and reproduction. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands;
(iii) Sources of food, expected to be detritus occurring in the pools, contributed by overland flow from the pools' watershed, or the results of biological processes within the pools themselves, such as single-celled bacteria, algae, and dead organic matter, to provide for feeding; and
(iv) Structure within the pools described in paragraph (ii) of this section, consisting of organic and inorganic materials, such as living and dead plants from plant species adapted to seasonally inundated environments, rocks, and other inorganic debris that may be washed, blown, or otherwise transported into the pools, that provide shelter.

Recovery Plan Information

Recovery Actions

- Protect vernal pool habitat in the largest blocks possible from loss, fragmentation, degradation, and incompatible uses (Service, 2005).
- Manage, restore, and monitor vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (Service, 2005).
- Conduct range-wide status surveys and status reviews for all species addressed in this recovery plan to determine species status and progress toward achieving recovery of listed species and long-term conservation of species of concern (Service, 2005).
- Conduct research and use results to refine recovery actions and criteria, and guide overall recovery and long-term conservation efforts (Service, 2005).
- Develop and implement participation programs (Service, 2005).

- Additional preservation of known extant occurrences is needed to reduce threats and reach recovery goals outlined in the Recovery Plan. Therefore, preservation of Zone 1 and 2 core areas should be pursued. The areas requiring the highest conservation action due to loss of habitat and/or lack of protected areas include the Northwestern Sacramento Valley (where there are limited protected areas, limited restoration possibilities, and rapid urban expansion, particularly in the Redding area); the Northeastern Sacramento Valley (where, despite the presence of some large preserves, there are limited protected areas in much of the region, a high number of sensitive species, and a high urban-conversion rate); the Southeastern Sacramento Valley (where there are limited protected areas and a high urban-conversion rate); the San Joaquin Valley (where greater emphasis on pool conservation is needed in the northeastern and southern portions of the valley); and the Southern Sierra Foothills (where large areas of the region are being urbanized or converted to agriculture without vernal pool resource mitigation). The Service should work with private landowners for the conservation of vernal pool tadpole shrimp through conservation easements or other methods (Service, 2007).
- A standardized formal monitoring program should be developed and implemented to collect data in sufficient detail to evaluate species status, and examine changes in population dynamics and community composition. Monitoring should be conducted in areas with known occurrences throughout the range of this species, including revisiting historical survey sites. Many occurrences reported in the CNDDB (2007) have not been visited in more than a decade. An updated status-review of all known occurrences should be completed. In addition, a statewide vernal pool habitat mapping inventory should be implemented to quantify the actual acreage of vernal pools and acres protected (Service, 2007).
- Research should be conducted on the extant distribution of the vernal pool tadpole shrimp, to better understand why it is absent from seemingly suitable vernal pools between areas that are known to be occupied by this species, and to understand the specifics of pools where this species occurs. Additional research should be conducted at regularly surveyed sites to incorporate research recommendations outlined in the Recovery Plan (Service, 2007).
- Results from monitoring and research should be included in the management plans for protected sites supporting occurrences of this species. There is a need to develop management indicators for identifying potential problems and assessing ecosystem health as it pertains to vernal pool crustaceans. Requirements for appropriate management of vernal pool landscapes also must be established. Because of urban encroachment and resulting hydrological changes, conservation efforts should be focused on managing for unseasonable sources of water that infiltrate vernal pool preserves, resulting in changed site hydrology. Improved guidelines and success criteria also should be established for the monitoring of constructed and restored pools (Service, 2007).
- Presence-absence survey guidelines should be improved. The current methodology is not always effective for documenting the presence of the species with confidence, given the species' adaptations to environmental fluctuations. Surveys, monitoring of conservation areas, and reporting should be standardized so that data can be systematically compared across sites (Service, 2007).

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Plants

Ash-Grey Paintbrush Critical Habitat

Critical Habitat

The Service designated approximately 1,769 acres of critical habitat for the species on December 26, 2007 (72 FR 73092) on Federal, state, and private lands. The physical and biological features of critical habitat for this species are: (1) pebble plains in dry meadow-like openings, or non-pebble plain dry meadow margin areas, within upper montane coniferous forest, pinyon-juniper woodlands, or Great Basin sagebrush in the San Bernardino Mountains of San Bernardino County, California; at elevations between 5,900 and 9,800 feet that provide space for individual and population growth, reproduction and dispersal; (2) seasonally wet clay, or sandy clay soils, generally containing quartzite pebbles, subject to natural hydrological processes that include water hydrating the soil and freezing in winter and drying in summer causing lifting and churning of included pebbles, or seasonally wet silt or saline clay soils in non-pebble plain dry meadow margin areas that provide space for individual and population growth, reproduction and dispersal, adequate water, air, minerals, and other nutritional or physiological requirements to the species; and (3) the presence of one or more of its known host species, such as *Eriogonum kennedyi* var. *austromontanum*, *Eriogonum kennedyi* var. *kennedyi*, and *Eriogonum wrightii* var. *subscaposumon* in pebble plains habitat and species such as *Artemisia tridentata*, *Artemisia nova*, and *Eriogonum w.* var. *s.* in pebble plains and non-pebble plain meadow margin habitat that provide some of the physiological requirements for this species. For more detailed information about the species description, legal/listing status, distribution and population trends, life history, habitat affinities, and the status of critical habitat, please refer to the mentioned Federal Register documents and the 5-year review for this species (Service 2013).

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Baker's Larkspur

Listing Status

This species was listed as endangered on January 26, 2000 (65 FR 4156).

Life History and Habitat

Baker's larkspur is a perennial herb in the buttercup family. The plant occurs in decomposed shale in the mixed woodland plant communities of Sonoma and Marin Counties, California (USFWS 2015).

Baker's larkspur grows from a thickened, tuber-like fleshy cluster of roots. The stems are hollow, erect, and grow to 65 centimeters (26 inches) tall. The leaves are five-parted, occur primarily along the upper third of the stem, and are green at the time the plant flowers. The whitish area in the center of the leaves is a distinctive feature. The flowers are irregularly shaped. The five sepals are conspicuous, bright dark blue or purplish, with the rear sepal elongated into a spur. The inconspicuous petals occur in two pairs. The lower pair is blue-purple; the upper pair is white (USFWS 2015).

Baker's larkspur flowers from April into May. Pollination is by bumblebees and hummingbirds. The species is self-compatible but requires visitation by pollinators for good seed set. Seeds are produced in several dry, many-seeded fruits, called capsules, which split open at maturity on only one side (USFWS 2015).

Population Status

Baker's larkspur is only known from three locations: Coleman Valley in southern Sonoma County, near the town of Tomales in northern Marin County, and approximately 10 kilometers (6 miles) east of Tomales Bay in northern Marin County (USFWS 2015, 2019). Baker's larkspur is thought to have been extirpated from Coleman Valley and from near Tomales (USFWS 2015, 2019). As of 2023, there are three extant populations of Baker's larkspur: one historical population and two introduced populations (CDFW 2023). The only known remaining naturally occurring population of this species is found in Marin County on a steep roadside embankment (CDFW 2023).

Recovery Plan Information

The Recovery Plan for Baker's larkspur was published in September 2015 (USFWS 2015). The strategy used to recover Baker's larkspur is focused on increasing the number of populations by reintroducing a sufficient number of populations to ensure they can withstand catastrophic events and ensuring each of the populations is large enough to withstand stochastic events through continued supplementation and management of reintroduced populations. To achieve this goal, we have defined the following objectives:

1. Expand the existing populations of Baker's larkspur and establish additional self-sustaining populations of Baker's larkspur throughout its known ecological and geographical range, while preserving extant genetic diversity.
2. Ensure existing and future populations are protected from incompatible uses, such as road maintenance.
3. Reduce herbivory by slugs, snails and gophers to the point that it does not affect the species at a population level.

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Beach Layia

Listing Status

Beach layia (*Layia carnosa*) was listed as endangered on June 22, 1992 due to displacement by invasive, non-native vegetation, recreational uses such as off-road vehicles and pedestrians, and urban development. It was reassessed in 2021 and was reclassified as threatened on March 31, 2022.

Life History and Habitat

Beach layia is a succulent annual herb belonging to the sunflower family (Asteraceae). The unbranched to highly branched plants range up to 6 in (15.2 cm) tall and 16 in (40.6 cm) across (Baldwin et al. 2012). Characteristics distinguishing beach layia from similar species include its fleshy leaves, inconspicuous flower heads with short, 0.08 to 0.1 in (2 to 2.5 mm) long white ray flowers (occasionally purple) and yellow disk flowers, and bristles around the top of the one-seeded achene, or dry fruit (Service 1998). The number of seed-heads on individual plants varies with plant size (Service 1998). Typically, unbranched, short plants on dry, exposed sites will produce a single head, while highly branched plants in moist dune hollows may produce more than 100 heads (Service 1998).

Beach layia is self-compatible and capable of self-pollination and is visited by a variety of insects that may assist in cross-pollination (Sahara 2000). Even if beach layia reproduces mainly by selfing, it is still possible that outcrossed seeds have a higher probability of survival and contribute more to fitness (Sahara 2000), though this has not been tested. It is unclear what the role of pollinators are; however, it has been noted that it is commonly visited by native bees, tachinid flies and small black beetles (Ruiz-Lopez and Mesler 2019).

As a winter annual, beach layia germinates during the rainy season between fall and mid-winter, blooms in spring (March to July), and completes its life cycle before the dry season (Service 1998). Populations tend to be patchy and subject to large annual fluctuations in size and dynamic changes in local distribution associated with the shifts in dune blowouts, remobilization, and natural dune stabilization that occur in the coastal dune ecosystem. (Service 1998) Beach layia plants often occur where sparse vegetation traps wind-dispersed seeds, but causes minimal shading. Seeds are dispersed by wind mostly during late spring and summer months (Service 1998).

Beach layia occurs in the open spaces between the low growing perennial plants in the *Abronia latifolia* – *Ambrosia chamissonis* herbaceous alliance (dune mat) and *Leymus mollis* herbaceous alliance (sea lyme grass patches) (Sawyer 2009). Dune mat is composed of herbaceous low-growing vegetation adapted to the low nutrient soils and drought-like conditions of the dunes. It includes perennials such as (but not limited to): yellow sand verbena (*Abronia latifolia*), beach bur (*Ambrosia chamissonis*), beach bluegrass (*Poa macrantha*), coast buckwheat (*Eriogonum latifolium*), beach pea (*Lathyrus littoralis*), dune goldenrod (*Solidago spathulata*), and coastal sagewort (*Artemisia pycnocephala*) (Sawyer 2009). Sea lyme grass (now treated as *Elymus mollis* in the Jepson Manual, Baldwin 2012) is dominant or characteristically present in sea lyme grass patches and co-dominants include the same plants present in the dune mat community listed above (Sawyer 2009). Typically, the total vegetation cover in both communities is relatively sparse and many annual species, including beach layia, colonize the space between established, tufted perennials. Beach layia can also occur in narrow bands of moderately disturbed habitat along the edges of trails and roads in dune systems dominated by invasive species.

Population Status

Beach layia populations surveyed from Santa Barbara County to Humboldt County near the time that the recovery plan was written (1998) were estimated at 300,000 individuals (Service 1998, p. 43). Of the known historical populations, four are considered extirpated, including the San Francisco population, the

Point Pinos population in the Monterey area, and two populations north of the Mad River in Humboldt County. All currently extant populations were known at the time of the recovery plan with the exception of the Freshwater Lagoon population that was discovered in 2000. Based on estimates conducted at the time the recovery plan was written (500,000 plants in 1997 and one million in 1998 at the Lanphere Dunes Subpopulation (Pickart 2018, pers. comm.)), it is likely that the original estimate of 300,000 plants total was a gross underestimate (Service 2011, p. 21).

Estimates of abundance and occupied habitat for beach layia cited in this analysis are primarily based on Humboldt Bay area distribution mapping in 2017 (Service 2018); Point Reyes NS in 2010 (Point Reyes NS 2010); the King Range National Conservation Area at the mouth of the Mattole River in 2004 (BLM 2005), and the California Natural Diversity Database (CNDDB 2017) in combination with information provided by land managers for smaller populations throughout the species' range and is summarized in the 2018 Beach Layia Species Status Assessment.

Overall, an estimated 595 acres (240 ha) of near-shore dunes habitat is known to support approximately 30 million beach layia (Service 2018). Humboldt and Marin Counties contain approximately 99.6 percent of the occupied habitat rangewide. The populations in Monterey and Santa Barbara counties are much smaller and in danger of extirpation with the Monterey populations supporting less than 3,000 plants on less than two acres and the Santa Barbara populations supporting approximately 5,000 plants on less than one acre (Service 2018). Federal agencies own or manage about 73 percent of the occupied habitat (433 ac (175 ha), State agencies 2.5 percent (15 ac (6 ha)), local governmental entities 2.5 percent (15 ac (6 ha)) and non-governmental organizations 14 percent (83 ac (34 ha)), and the remaining 8 percent (50 ac (20 ha)) is private ownership.

Recovery Plan Information

The Seven Coastal Plants and the Myrtle's Silverspot Butterfly Recovery Plan was issued on September 29, 1998. Recovery actions for beach layia include:

1. Remove invasive non-native species including European beachgrass, iceplant, yellow bush lupine and pampas grass.
2. Implement vehicle management.
3. Establish new colonies of beach layia and reintroduce plants at historical locations.
4. Obtain written assurances of long-term support for continued management of the dunes and biological monitoring.

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Bear Valley Sandwort Critical Habitat

Critical Habitat

The Service designated approximately 1,412 acres of critical habitat for the species on December 26, 2007 (72 FR 73092) on Federal and private lands. The physical and biological features of critical habitat for this species are: (1) pebble plains in dry meadow-like openings within upper montane coniferous forest, pinyon-juniper woodlands, or Great Basin sagebrush in the San Bernardino Mountains of San Bernardino County, California; at elevations between 5,900 to 9,800 feet that provide space for individuals and population growth, reproduction, and dispersal; and (2) seasonally wet clay, or sandy clay soils, generally containing quartzite pebbles, subject to natural hydrological processes that include water hydrating the soil and freezing in winter and drying in summer causing lifting and churning of included pebbles, that provide space for individual and population growth, reproduction and dispersal, adequate water, air, minerals, and other nutritional or physiological requirements to the species. For more detailed information about the species description, legal/listing status, distribution and population trends, life history, habitat affinities, and the status of critical habitat, please refer to the mentioned Federal Register documents and the 5-year review for this species (Service 2015).

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Ben Lomond Wallflower

Listing Status

The Service listed Ben Lomond wallflower (*Erysimum teretifolium*) as endangered on February 4, 1994 (Service 1994, entire). Ben Lomond wallflower is included in the Recovery Plan for Insect and Plant Taxa from the Santa Cruz Mountains in California (Service 1998, entire).

Life History and Habitat

Ben Lomond wallflower is a biennial to short lived perennial plant in the mustard family (Brassicaceae). Seedlings form a basal rosette of leaves which then wither as the main stem develops a raceme (flowers clustered in a terminal spike). Stems may range between 14 and 100 centimeters in height. Leaves originating from the stem are 0.3-3 millimeters wide, thread-like to narrowly linear, finely toothed, with a margin slightly rolled under. The flowers are a deep yellow with petals 1.5-2.5 centimeters long. The fruit, a slender capsule (silique), is commonly 7-10 centimeters long and is sparsely hairy (Ihsan 2012, NA). Characteristics that separate this plant from other wallflowers include simple, narrowly linear leaves that have small marginal teeth and a purplish cast.

<u>Habitat</u>

Ben Lomond wallflower occurs within the sandhills of the Santa Cruz Mountains. The central range of the species is generally bounded by the communities of Ben Lomond, Glenwood, Scotts Valley, and Felton in Santa Cruz County (Figure 1). An outlying population is found at Bonney Doon Ecological Reserve approximately 5 miles west of the central concentration of occurrences. Typical Ben Lomond wallflower habitat is characterized by sandy soil and bare ground in areas lacking competition and shading from shrubs, trees, leaf litter, or dense cover of competing forbs and grasses. Ben Lomond wallflower is adapted to tolerate moderate levels of disturbance that inhibit woody vegetation growth but allow it to complete its life cycle, which typically requires 2 to 3 years (biennial). The distribution of Ben Lomond wallflower is island-like because suitable habitat is interrupted by areas of unsuitable soils and vegetation, as well as development. The resulting populations are potentially genetically isolated from one another depending on the distance pollinators may travel.

Within the sandhills, Ben Lomond wallflower occurs at greatest frequency and abundance within the sand parkland and sand chaparral vegetation communities (McGraw 2019, pp. 7-8). Sand parkland is characterized by a sparse tree canopy (less than 50 percent cover) of ponderosa pine (*Pinus ponderosa*) and coast live oak (*Quercus agrifolia*) and low cover of chaparral shrubs (less than 25 percent). Sand parkland has an herbaceous understory of native and exotic annual forbs and grasses. Often, the understory is dominated by exotic species including rat-tail fescue (*Festuca myuros*), rip-gut brome (*Bromus diandrus*), rattlesnake grass (*Briza maxima*), smooth cat's ears (*Hypochaeris glabra*), and sheep sorrel (*Rumex acetosella*). Native species characteristic of the sand parkland understory include pussypaws (*Calyptridium monospermum*), golden aster (*Heterotheca sessiliflora*), yarrow (*Achillea millefolium*), and bracken fern (*Pteridium aquilinum*).

Sand chaparral is characterized by the presence of chaparral shrubs such as silverleaf manzanita (*Arctostaphylos silvicola*), chamise (*Adenostoma fasciculatum*), mock heather (*Ericameria ericoides*), sticky monkeyflower (*Diplacus aurantiacus*), buck brush (*Ceanothus cuneatus*), black sage (*Salvia mellifera*), and golden yarrow (*Eriophyllum confertiflorum*). Trees, such as knobcone pine (*Pinus attenuata*), may be present but with low cover (less than 20 percent) (McGraw 2019, pp. 7, 15-19). In sand chaparral, Ben Lomond wallflower occurs within gaps between these species in areas that are not shaded by shrubs. As density of chaparral shrubs increase, habitat suitability for Ben Lomond wallflower decreases.

Reproduction

Ben Lomond wallflower is a monocarpic (blooms once, then dies) biennial plant that produces leaves but not flowers in the first year after germination. Flowers are typically produced in the second year (less frequently 3 years and rarely 4 years after germination) and die after seed set. Rarely will plants flower in the first year following germination or survive to flower and set seed more than once. In a recent experimental introduction study, approximately 11 percent of seedlings survived to produce an inflorescence in the second year (McGraw et al. 2020, p. 41). Herbivory pressure is high on both vegetative and flowering individuals, reducing the number of plants that set seed (McGraw and Chrislock 2019a, p. 15). Germination and survivorship have been observed to follow annual rainfall patterns, with wetter years having greater germination and survivorship than drought years (McGraw and Jordan 2021, pp. 19-20).

Ben Lomond wallflower is largely self-incompatible, needing pollen from flowers not on the same plant in order to produce seed (Melen et al. 2016, p. 1983). Self-pollination sometimes results in fruit development, but the number of seed produced averages 6.5 times less than the amount of seed produced from cross pollination (Melen et al. 2016, p. 1983). Cross pollination between populations produces slightly more seed per fruit than cross pollination within population, suggesting that the small populations may be experiencing inbreeding depression (Melen et al. 2016, p. 1983). Bees, butterflies, and beetles are the most commonly observed floral visitors (Melen et al. 2016, p. 1982-1983). Pollen limitation was evaluated as a potential source of population declines, but manually adding pollen to flowers did not increase seed set, suggesting that populations of Ben Lomond wallflower are not pollen limited (Parker et al. 2011, p. 1; Melen et al. 2016, pp. 1980, 1983).

Genetics

In 2020, a study evaluated a subset of Ben Lomond wallflower populations to test predictions about the distribution of genetic diversity in a highly fragmented species that is also an outcrossing obligate (del Valle et al. 2020, entire). del Valle et al. (2020, p. 13) found that the majority of genetic diversity was found within populations, rather than among populations, suggesting that the mating system was the driving factor in determining the distribution of genetic diversity. The remaining genetic diversity could be explained by an abundant center model, where populations become increasingly differentiated from a central cluster of populations as distance increases (del Valle et al. 2020, p. 18). The study also found evidence that individuals from Quail Hollow Ranch Park had been introduced to Bonny Doon Ecological Reserve, potentially in an attempt to rescue the declining population at Bonny Doon Ecological Reserve (del Valle et al. 2020, pp. 13, 15). del Valle et al. (p. 19) concluded that a majority of the genetic diversity found within Ben Lomond wallflower populations could be preserved within a single population, but some unique genetic information was isolated within peripheral populations and thus should be considered a conservation priority to retain all observed genetic diversity within the species. Additional research is needed to further understand which populations have the highest conservation value for preserving a majority of, as well as unique, genetic diversity because only a subset of populations were evaluated.

Population Status

Rangewide Status of the Species

Population abundance data are only available for Quail Hollow Quarry Conservation Areas, Zayante Sandhills Conservation Bank, Bonny Doon Ecological Reserve, and Quail Hollow Ranch Park. The remaining locations have no information on abundance and population trends or have infrequent single year data. Data from Quail Hollow Ecological Reserve (also known as Quail Hollow Ranch County Park) between 2012 and 2022 suggest that the population is stable, with reproductive adults ranging between 200 and 400 plants (T. Kasteen 2022, pers. com.). The abundance of adult plants is measured as density and frequency at the Quail Hollow Quarry Conservation Areas and has remained relatively stable, but low, ranging between 1 and 6 plants within 20-meter squared plots between 2006 and 2020 (McGraw and Jordan 2021, p. 42). The number of plants within the Zayante Sandhills Conservation Bank has been historically low because that location captures only a small portion of a larger population within the Quail Hollow Quarry Conservation Areas. There was only a single adult plant observed in 2015 when annual monitoring began. However, through management and experimental outplanting, the number of adult plants increased to 10 in 2021 (McGraw and Chrislock 2021, p. 27). The plants at the Zayante Sandhills Conservation Bank are best viewed as a small portion of a larger population that is increasing due to management efforts. The naturally occurring population at Bonny Doon Ecological Reserve has declined to six naturally occurring adult plants in 2022 (Kasteen 2022, pers. com.). The population has ranged between 1 and 50 adult plants since annual data began being collected in 2005. Experimental reintroductions have also taken place at this location with 837 adult plants observed in reintroduction areas in 2021 but declining to 189 plants in 2022 (Kasteen 2022, pers. com.). Herbivory, invasive species, litter, and drought have been attributed to the decline of the natural population and threaten the persistence of the reintroduction effort (Kasteen 2022, pers. com).

Ben Lomond wallflower populations are being managed on several Land Trust of Santa Cruz properties with abundance estimates from 2018 ranging from less than ten to approximately 100 adult individuals (McGraw 2019, data). No evaluation of trend can be made from the single year data.

Several other populations are possibly extirpated because no individuals were observed the last time data were recorded (Service 2008, pp. 6-8). These locations are unmanaged, and herbivory, increases in woody cover, invasive species, litter, and drought have contributed to the decline of the species. The remaining populations lack data from which to make an assessment. However, because they are on private land and subject to the same threats as managed populations, it is likely that they have experienced similar declines in abundance.

Recent evaluations of the seed bank at Bonny Doon Ecological Reserve suggest that there is little to no seed that remains ungerminated year to year (Parker et al. 2011, pp. 9-11; McGraw et al. 2020, p. 56). Therefore, the seed bank is unlikely to rescue the declining population at this location. These results from Bonny Doon Ecological Reserve are not representative of all populations; however, they may indicate that populations with similar declines in numbers of reproducing plants also have depleted, or decreasing, seed banks.

Threats

Habitat loss from sand quarries was the primary threat to Ben Lomond wallflower at the time of listing and was the dominant cause of habitat loss prior to listing (Service 1994, pp. 5504-5506). Residential development, fire suppression resulting in habitat conversion, and recreational activities and vandalism have also decreased the amount of suitable habitat for Ben Lomond wallflower (Service 1994, p. 5504-5506). Current threats to Ben Lomond wallflower include sand quarrying, fire suppression resulting in habitat conversion, the combined impacts of residential development, vandalism, and recreation, stochastic extirpation, agricultural conversion, herbivory, inbreeding depression, and climate change threats to Ben Lomond wallflower (Service 2022, pp. 9-14).

Sand Quarrying

The Quail Hollow Quarry remains the only active sand quarry within the range of Ben Lomond wallflower. However, the amount of habitat lost from sand quarries has not been restored, resulting in lingering effects of past sand quarrying. For example, at the Olympia Quarry, exotic species cover and thin soils may be preventing the natural recolonization of Ben Lomond wallflower and its habitat, despite no active quarrying (McGraw and Chrislock 2019b, pp. iv-vii). At the Quail Hollow Quarry, populations had declined, necessitating active management, including reintroduction from the remaining on-site populations, to prevent extirpation. The habitat degradation resulting from sand quarrying will remain a threat to Ben Lomond wallflower if current and former quarries are not restored to habitat that is suitable for the species. The areas of current or former sand quarrying represent the best opportunity for recovery of Ben Lomond wallflower and other federally endangered or threatened sandhills species.

Fire Suppression/Habitat Conversion

Fire exclusion has resulted in the loss of open sand habitat within sand parkland and sandhills chaparral by promoting establishment and growth of shrubs and trees that create shade and litter that excluded Ben Lomond wallflower (McGraw 2004, pp. 25, 86-89). This has become an increasingly serious threat since listing (Service 1994, p. 5504; Service 2008, pp. 13-15). Data from the Quail Hollow Quarry Conservation Areas and Zayante Sandhills Conservation Bank have shown that Ben Lomond wallflower will decline if native and exotic vegetation, or litter, increase in the absence of disturbance (McGraw 2021, pp. 9-10; McGraw and Chrislock 2019a, pp. 14-15). Ben Lomond wallflower does not require fire for germination, but fire was likely the historical mechanism that maintained low vegetation cover in sandhill habitats (McGraw 2004, pp. 168-169). In the absence of fire, mechanical disturbance may result in similar reduction in competing biomass and may be more feasible in some circumstances than prescribed burns (McGraw and Chrislock 2020, pp. 22-28). However, the beneficial effects of vegetation removal either by mechanical means, prescribed fire, or natural fire, to increase gaps in sand parkland and sandhill chaparral may be short lived. In 2008, the Martin Fire burned large portions of the Bonny Doon Ecological Reserve, most of which had returned to pre-fire levels of canopy closure by 2020 (McGraw et al. 2020, p. 13).

Residential Development/Vandalism and Recreation

Recreation, private development, and vandalism result in habitat degradation and fragmentation (Service 2008, p. 10). Current levels of recreation are not monitored throughout the species' range, though recreation monitoring occurs at the Zayante Sandhills Conservation Bank and Quail Hollow Quarry Conservation Areas (McGraw and Chrislock 2022, p. 5; McGraw 2021, pp. 4-5, Appendix C). Mountain biking and hiking are the most likely forms of recreation to impact Ben Lomond wallflower and are present at many of the publicly accessible areas where the species occurs. Recreation disturbance can be both a threat and potentially beneficial to the species. Too frequent and intense disturbances will inhibit establishment and result in mortality of any plants present. The biennial life history of Ben Lomond wallflower increases the chance of mortality from recreational activities because plants usually take 2 years to reproduce. Infrequent and lower intensity disturbance may inhibit woody vegetation, exotic species, or reduce the amount of accumulated litter which could promote Ben Lomond wallflower; however, any disturbance that is likely to inhibit woody vegetation establishment may also inhibit Ben Lomond wallflower establishment if the frequency and intensity is great enough. In general, the disturbance caused by established hiking and biking trails is too severe and too frequent to benefit Ben Lomond wallflower.

Current levels of private development and vandalism are not easily quantified. Historically, vandalism of Ben Lomond wallflower populations occurred in areas where the plant was seen as a barrier to development. The likelihood of this type of vandalism still occurring is unknown and, without consistent survey data throughout the range of the species, it may be difficult to differentiate between declines in abundance due to other threats or vandalism. Less malicious forms of vandalism are associated with residential areas that are adjacent to land that is under management for conservation of Ben Lomond wallflower. At the Zayante Sandhills Conservation Bank, dumping, creating defensible space, and ornamental landscaping historically occurred beyond the boundaries of private properties into the conservation area. This has been reduced through outreach and does not currently occur at levels warranting further action (McGraw and Chrislock 2022, pp. 7-8). The sandhill habitats where Ben Lomond wallflower occurs are regulated by Santa Cruz County and any new residential development would have protections for Ben Lomond wallflower, although confidence in the effectiveness of this regulation is low (Service 2012, p. 13).

Stochastic Extirpation

Stochastic extirpation is a threat to Ben Lomond wallflower because of its limited range, small population sizes, and habitat fragmentation between occupied patches. Ben Lomond wallflower may be particularly susceptible to local extirpation by stochastic events because observational data suggest that a viable seed bank is lacking at declining populations, such as the Bonny Doon Ecological Reserve (Parker et al. 2011, pp. 9-11; McGraw et al. 2020, p. 56). The biennial life history, which requires plants to survive through summers with little to no precipitation and high temperatures to reproduce, also increases susceptibility to stochastic events because seed that germinates within one year may not survive to produce seed in the following year resulting in a depletion of any existing seed bank. Natural and experimental disturbances have failed to germinate seed that may be stored in a seedbank, further suggesting that a stochastic event may not be rescued through reestablishment from an existing seed bank (McGraw et al. 2020, p. 56).

Agricultural Conversion

The threat of agricultural conversion has been considered low since listing and there have been no changes in this assessment (Service 2022, p. 12). Grape production for winemaking and cannabis cultivation are potential agricultural activities that have impacted undeveloped areas in the region and could affect Ben Lomond wallflower or suitable habitat.

Herbivory

Herbivory has likely contributed to population declines. Pocket gophers (*Thomomys bottae*), brush rabbits (*Sylvilagus bachmani*), mice (e.g., *Peromyscus* spp.), and black-tailed deer (*Odocoileus hemionus*) have been observed browsing the leaves or the flowering stalk of Ben Lomond wallflowers (McGraw and Chrislock 2019a, p. 15). Pocket gophers may consume the entire plant, as evidenced by a previously marked plant that was subsequently missing with a gopher mound in its place. Vegetative herbivory increases the likelihood that the plant will not survive to produce flowers. This exacerbates the already low rates of reproduction due to drought mortality. Plants that do survive to produce a flowering stalk are often grazed by black-tailed deer, which reduces the amount of seed produced (McGraw and Chrislock 2019a, p. 15). Herbivory appears to occur more frequently in sand chaparral habitat compared to sand parkland habitat, likely due to the cover that shrubs provide foraging herbivores from predators (e.g., raptors) (McGraw and Chrislock 2019a, p. 15). Herbivory from small mammals, as well as birds, occurred at the Bonny Doon Ecological Reserve despite efforts to protect plants from herbivory through caging (McGraw et al. 2020, p. 58).

Invasive Species

Invasive species outcompete Ben Lomond wallflower by decreasing the amount and size of vegetation gaps within sand chaparral and sand parkland habitat, as well as through shading and competition for nutrients and water (McGraw 2004, pp. 240-244, 253-254). Invasive species that have established within former sand quarries are difficult to control, making reintroduction and recovery of Ben Lomond wallflower at those sites difficult. Portuguese broom (*Cytisus striatus*), French broom (*Genista monspessulana*), and silver wattle (*Acacia dealbata*) are three common woody invasive species that have been observed to establish rapidly in areas with low levels of disturbance (BEC 2021a, p. 6; BEC 2021b, p. 4; McGraw and Chrislock 2022, p. 4). Once established, these and related species require annual removal efforts.

Sand chaparral and sand parkland soil is typically low nutrient, which may inhibit invasive herbaceous species colonization. Pollution may increase nitrogen deposition and increase the fertility of the nutrient-poor soils, facilitating the potential establishment of invasive species (McGraw 2019a, p. 39). Herbaceous exotic species such as rat-tail fescue, rip-gut brome, rattlesnake grass, smooth cat's ears, and sheep sorrel already constitute a major component of sand parkland habitat. These species are in lower densities in sand chaparral habitat (McGraw 2019a, pp. 7, 10-19). Complete removal of herbaceous exotic species is difficult due to established seed banks and presence in surrounding areas facilitating passive dispersal. Where herbaceous invasive species are limiting Ben Lomond wallflower presence continued active management will be required for recovery (McGraw and Chrislock 2022, pp. 4, 48, 53).

Inbreeding Depression

Most populations of Ben Lomond wallflower have declined since the species was listed in 1998 (Service 2008, p. 7). Current population numbers are relatively small, and populations are likely isolated from one another due to topography, development, and distance, resulting in very low gene flow among populations. Because Ben Lomond wallflower is an obligate outcrosser, and is largely self-incompatible, populations must be large enough to reduce the chance of inbreeding depression, which can lower survivorship and decrease above-ground biomass (Melen et al. 2016, p. 1984). Bees, butterflies, and beetles are the most commonly observed Ben Lomond wallflower floral visitors (Melen et al. 2016, pp. 1982-1983). Of these, bees are the most common and foraging distances range from less than a quarter of a mile to several miles depending on the species of bee (Zurbuchen et al. 2010, pp. 671-672). Solitary bees typically have foraging distances around a quarter mile compared to honeybees (*Apis mellifera*), which may have foraging distances of up to several miles (Beekman and Ratnieks 2000, pp. 671-672). An evaluation of seed production and genetic diversity within and between populations found that Ben Lomond wallflower was not pollen limited, suggesting that there are adequate pollinators to facilitate the greatest possible seed set (Melen et al. 2016, p. 1983). The same study found that the evaluated populations of Ben Lomond wallflower were experiencing inbreeding depression and that there was no evidence of local adaptation or outbreeding depression (Melen et al. 2016, pp. 1984, 1987-1988).

Climate Change

Ben Lomond wallflower may be affected by climate change most directly through changes in, and variability of, precipitation and minimum and maximum temperatures. Average precipitation is predicted to increase by 4.1 to 9.8 inches, minimum average temperature by 4.8 to 9.7 degrees Fahrenheit, and maximum average temperature by 4.4 to 7.0 degrees Fahrenheit by 2099 throughout Santa Cruz County (Langridge et al. 2018, pp. 13-17). Despite the predicted increase in precipitation, the areas occupied by Ben Lomond wallflower may experience fewer total days of precipitation relative to historical averages because of an associated increase in precipitation variability and timing. Current climate models suggest that there will be fewer days of higher-than-average precipitation, leading to an increased number of dry days between precipitation events (Langridge et al. 2018, p. 16). Because timing of precipitation impacts germination and survivorship, changes in variability and timing are likely to have a greater impact on the recovery of Ben Lomond wallflower than the predicted change in the amount of precipitation, or the increases in average minimum and maximum temperatures (McGraw and Jordan 2021, pp. 19-20). Current data suggest germination and survivorship are correlated with annual rainfall (McGraw and Jordan 2021, pp. 19-20). Periods of drought and increased temperatures may result in decreased soil moisture, decreasing the likelihood that seeds germinate, and juvenile plants survive to seed set.

Recovery Plan Information

Recovery Objectives/Downlisting Criteria

The following downlisting criteria were developed in the recovery plan for Ben Lomond wallflower and are paraphrased below (Service 1998, p. iv, 46):

1. The 17 currently known populations of Ben Lomond wallflower have been secured through fee-title acquisition, conservation easements, or habitat conservation plans.
2. Management plans for populations on Quail Hollow Ranch County Park and Bonny Doon Ecological Reserve are developed and being implemented.
3. Conservation measures for Ben Lomond wallflower are included in habitat conservation plans (Granite Rock Quarry, Kaiser Sand and Gravel Felton Plant, and the County of Santa Cruz) that have been developed and implemented for cooccurring insect species.
4. Population numbers are stable or increasing.

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Butte County Meadowfoam and its Critical Habitat

Listing Status

The Butte County meadowfoam (*Limnanthes floccosa* ssp. *californica*) was listed as endangered on June 8, 1992 (57 FR 24192). Critical habitat was designated for the Butte County meadowfoam on February 10, 2006 (71 FR 7118).

Life History and Habitat

The Butte County meadowfoam inhabits valley and foothill grasslands (mesic soils). It grows in three types of seasonal wetlands: ephemeral drainages (i.e., swales), vernal pool depressions in ephemeral drainages, and occasionally around the edges of isolated vernal pools (57 FR 24192, NatureServe 2015). This species occurs on alluvial terraces in annual grasslands with mima mound topography. The occurrences are found at 165 to 1,167 feet in elevation (CNDDB 2007). The species occurs in different soils on Tuscan-Igo-Anita Complex Fan terraces of 0-3 percent slope, 0-50 percent rock cobble with an underlying clay duripan. According to the 2006 Butte Area Soil Survey, L *Limnanthes floccosa* ssp. *californica* is found on 32 different "Musym" classes of soil, but always with an underlying duripan, rock cobble and common hydrological factors. *Limnanthes floccosa* ssp. *californica* has also been found occasionally in disturbed areas, such as drainage ditches, firebreaks, and graded sites (USFWS 2008).

This is an annual plant. *Limnanthes floccosa* ssp. *californica* typically begins flowering in February, reaches peak flowering in March, and may continue into April if conditions are suitable. Nutlets are produced in March and April, and the plants die back by early May. *Limnanthes floccosa* ssp. *californica* has floral adaptations that allow for cross-pollination by insects, but self-pollination mechanisms take over to ensure seed set if insect pollination is unsuccessful. The particular pollinators of *Limnanthes floccosa* ssp. *californica* have not been identified; however, other meadowfoam species are pollinated by the native burrowing bees *Andrena limnanthis* and *Panurginus occidentalis* and by honeybees, beetles, flies, true bugs (order Hemiptera), butterflies, and moths (USFWS 2008).

Nutlets of *Limnanthes floccosa* ssp. *californica* are apparently dispersed by water and can remain afloat for up to 3 days. Most meadowfoam nutlets are dispersed only short distances. Birds and livestock are potential sources of long-distance seed dispersal, but specific instances of such dispersal have not been documented (USFWS 2008).

Population Status

<u>Rangewide Status of the Species</u>

This species is endemic to California, only known from Butte County. Known historically and currently to occur only in Butte County within the Northeast Sacramento Valley Vernal Pool Region (USFWS 2008). At least eight new occurrences of *Limnanthes floccosa* ssp. *californica* have been discovered since 1988 (USFWS 2005).

<u>Population Summary</u>

When listed, there were 18 known extant occurrences of this subspecies (57 FR 24192). In 1989, less than 200,000 plants likely existed in the censused populations (57 FR 24192, NatureServe 2015). Quantitative information on the numbers of plants and area occupied by *Limnanthes floccosa* ssp. *californica* has not been collected in a consistent and systematic manner at all occurrences since the time of listing; therefore, definitive range-wide abundance and population trend information is not yet available (USFWS 2008). Some surveys have been conducted on individual locations with varying results. Surveys conducted in 2004 for *Limnanthes floccosa* ssp. *californica* indicate that some of the locations may be decreasing in numbers of plants. However, at least one occurrence, Rancho Arroyo (also known as Foothill Park East Preserve), was reported to have increased in area and in number of plants beginning in approximately 2005. Surveys conducted at Tuscan Preserve and Doe Mill Preserve over 15 years showed that numbers of plants fluctuated annually, reflecting the weather conditions (USFWS 2008).

Threats

Threats to this species include:

- Many occurrences are located on privately owned land and are unprotected. Habitat loss or degradation from urbanization continues to be the greatest threat to all occurrences of the subspecies, even to those that are protected from development (USFWS 2008).
- The Draft Land Management Plan for the Doe Mill Preserve noted that the occurrence of *Limnanthes floccosa* ssp. *californica* was "healthy" in 1991 but was reduced in numbers in 1996 and stressed from competition with the nonnative grass, *Taeniatherum caput-medusae* (medusa-head). *Glyceria declinata* (waxy manna grass) is a nonnative, perennial grass which may become a threat to *Limnanthes floccosa* ssp. *californica*. *Glyceria declinata* forms dense stands and is able to invade vernal pool habitat and displace native plants (USFWS 2008).
- Maintenance of the natural hydrology of these wetlands is necessary for the survival and recovery of this subspecies. Drought or flood conditions will place additional strains on the vernal pool ecosystems supporting *Limnanthes floccosa* ssp. *californica* occurrences. Climate change is also a stressor (USFWS 2008).
- Impacts from off-road vehicles continue to threaten to the subspecies (USFWS 2008).

Five-Year Status Review

On July 10, 2008, the USFWS issued a five-year status review of the Butte County meadowfoam, which resulted in no change in listing status (USFWS 2008).

Critical Habitat

Critical habitat was designated for the Butte County meadowfoam on February 10, 2006 (71 FR 7118). Critical habitat units are depicted for Tehama and Butte counties, California. Critical habitat is designated in four units totaling 16,636 acres.

The primary constituent elements of critical habitat for the Butte County meadowfoam (*Limnanthes floccosa* ssp. *californica*) are the habitat components that provide (71 FR 7118):

(i) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools described in paragraph (ii) of this section, providing for dispersal and promoting hydroperiods of adequate length in the pools; and

(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and nonnative upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the Butte County meadowfoam (USFWS 2005).

Recovery Actions

- Establish a range-wide recovery implementation team (USFWS 2005).
- Establish working groups and develop participation plans for each vernal pool region (USFWS 2005).
- Develop and implement adaptive management plans based on monitoring data and best available science (USFWS 2005).
- Assist local governments in developing habitat conservation plans and developing land use protection measures (USFWS 2005).
- Assist private landowners in developing landowner agreements (USFWS 2005).
- Acquire habitat, where necessary (USFWS 2005).
- Track losses and protection of suitable habitat and occurrences within core areas (USFWS 2005).
- Ensure mechanisms are in place to provide for the perpetual management and monitoring of core areas, vernal pool regions, or for each management unit within a vernal pool region, as appropriate (USFWS 2005).

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California Orcutt Grass

Listing Status

California Orcutt grass was federally listed as endangered on August 3, 1993 due to habitat loss and degradation from urban and agricultural development, livestock grazing, off-road vehicle use, trampling, invasion from weedy non-native plants, and other factors (58 FR 41384).

Life History and Habitat

California Orcutt grass is a tufted annual grass, 2 to 8 inches tall. Its seeds germinate in the saturated and/or submerged soil of vernal pools, and plants are at first nearly prostrate. The plants produce more erect glandular pubescent stems when they are exposed as the pool dries up and subsequently produce flowers and seeds. California Orcutt grass seeds germinate while the pool is inundated, and plants appear prostrate during this phase of their life history. The plant's stems become more erect as the ephemeral pool dries out by evaporation, at which time the plants flower, usually between April and June, and set seed. It is doubtful that any significant amount of germination occurs in the absence of the pool being inundated. Like most grasses, its flowers are wind pollinated; however, it relies on fungi to play a role in stimulating germination (Service 2011).

Population Status

At the time of listing, California Orcutt grass was thought to be restricted to four general localities in California, located in Riverside and San Diego counties. These localities were the Santa Rosa Plateau, Skunk Hollow, and Salt Creek (now identified as the Stowe Pools) in Riverside County, and Otay Mesa in San Diego County. At the time, it was thought to be extirpated from Los Angeles County (Service 2011).

California Orcutt grass is currently considered to be extant at 25 occurrences: 3 occurrences in Ventura County, 3 occurrences in Los Angeles County, 7 occurrences in Riverside County, 1 occurrence in Orange County, and 15 occurrences in San Diego County. Since listing, California Orcutt grass was rediscovered at two occurrences in Los Angeles County and detected for the first time at three occurrences in Ventura County. These occurrences extend the range of the species by about 87 miles to the northwest. California Orcutt grass is still considered to be extant at the Santa Rosa Plateau, Skunk Hollow, and Upper Salt Creek (Stowe Pools) in Riverside County. Since listing, four previously unknown occurrences of the species have been found in Riverside County, and at least nine previously unknown occurrences have been found in San Diego County. In Baja California, Mexico, California Orcutt grass had been found historically on Mesa de Colonet and at San Quintin; the population at Mesa de Colonet has been confirmed as recently as 2019 and the San Quintin population is almost certainly extirpated (Service 2023; Sula Vanderplant 2023, pers. Comm.). A previously unknown population was identified in 2017 approximately 17 miles west of the town of Chapala (Service 2023). This information does not substantially alter our understanding of the distribution of California Orcutt grass.

All remaining California Orcutt grass habitat is threatened, to varying degrees, by many of the original threats. However, trampling associated with immigrant travel, military activities, and mowing and plowing of extant habitat have nearly been eliminated as threats. All other delineated threats remain, including rangewide threats associated with small population size and climate change, and may disrupt the presence and population dynamics of the species. Twelve occurrences face threats to the habitat from urban or agricultural development and off-highway vehicle traffic. Grazing remains as a threat to four of the occurrences, and nonnative plants threaten five occurrences. Outside of continued urbanization and direct/indirect effects associated with this threat, climate change may have the longest lasting potential for degrading the species long-term persistence, setting back potential recovery, or causing extinction.

Protections afforded by the Act and corresponding cooperative endeavors with private landowners, universities, and local and State governments, have reduced or ameliorated several of these threats since listing. As a result, conservation efforts afford protection to 11 of the 28 (39 percent) extant occurrences of California Orcutt grass from direct habitat loss due to development (Service 2011).

Recovery Plan Information

A recovery plan for California Orcutt grass and other vernal pool species was released on September 3, 1998 (Service 1998) and a clarification to this plan was released on October 1, 2019 (Service 2019). The delisting criteria include the following:

1) All 74 geographic areas and associated vernal pool complexes as identified in Appendices F and G of the 1998 Recovery Plan under each of the specific management areas are protected and managed to ensure long-term viability.
2) The Service must determine that the following factors are no longer present, or continue to adversely affect, California Orcutt grass: (a) the present or threatened destruction, modification, or curtailment of their habitat range; (b) over utilization for commercial, recreational, scientific, or educational purposes; (c) disease or predation; (d) the inadequacy of existing regulatory mechanisms; and (e) other natural and manmade factors affecting their continued existence.
3) Population trends continue to be stable or increasing for 10 consecutive years after threats have been sufficiently ameliorated or managed completion of delisting criterion 2 prior to consideration for delisting.

None of the criteria in the recovery plan have been completely met at this time, and many threats continue to impact the species. A better estimate of the population size in each pool complex is still needed to ensure the long-term persistence of the species. In addition, population trends also need to be monitored and must be stable or increasing for a minimum of 10 years prior to reclassification (Service 2011).

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Chorro Creek Bog Thistle

Listing Status

The Service listed the Chorro Creek bog thistle (*Cirsium fontinale* var. *obispoense*) as endangered in 1994 (U.S. Fish and Wildlife Service [Service] 1994, entire), and it was previously State listed as endangered in 1993 (California Department of Fish and Wildlife 2021, p. 6). The Service issued a recovery plan for the variety in 1998 (Service 1998, entire), and an amendment to it in 2019 (Service 2019, entire). We completed 5-year reviews in 2007, 2014, and 2022 (Service 2007, entire; 2014, entire; 2022, entire).

Life History and Habitat

Natural History

Chorro Creek bog thistle is a biennial or short-lived perennial plant standing up to 2.0 meters/6.6 feet tall that occurs only in San Luis Obispo County, California, west of the outer coast ranges. Chorro Creek bog thistle is a plant in the aster and sunflower family (Asteraceae). It is a serpentinite endemic, occupying perennial seeps and springs in serpentine soil and rock outcrops in western San Luis Obispo County from San Simeon Creek to the city of San Luis Obispo (Figure 2). Its spiny leaves have glandular hairs on the upper and lower surfaces, and its flowers are white, pink or lavender with a drooping posture. Each flower head produces approximately 73 seeds (mean), which are up to 4 millimeters/0.2 inch long and with a pappus (set of bristles) that aids dispersal. Chorro Creek bog thistle typically live 2 or 3 years. The plant forms a rosette of leaves in the first year that can attain up to 0.9 meters/3.0 feet in diameter. Stalk development begins during February or March of the second year, and it continues to May or early June with some plants attaining 2.0 meters/6.6 feet height, although a 0.5–1.0-meter/1.6–3.3-foot height is most common. Flowering generally occurs during May to mid-June, and with some branched stalks bearing greater than 25 flowers. Some living plants may persist into a third year if sufficient energy reserves remain. Under drought conditions, stalk development is less vigorous, and the buds and flower heads develop substantially faster, but fewer actually flower. Most occurrences are comprised of multiple colonies (spatial groups of separate individuals) Service 2022, p. 3).

Population Status

Rangewide Status of the Species

At federal listing in 1994, Chorro Creek bog thistle was known from nine occurrences (one of these presumed extirpated), of which only two occurrences were protected. The most recent total population estimate then was 2,300 individuals (Friedman 1986, p. 4). Identified threats were cattle grazing (trampling and herbivory), proposed development, water diversions, road maintenance, inadequacy of existing regulatory mechanisms, stochastic events (in particular drought), and invasive (non-native) plants (Service 1994, entire). In 2022, the conservation status was substantially improved with an increased number of known occurrences, along with an increased number of occurrences that were protected: 22 known occurrences, of which 9 having been protected (Service 2022, p. 10). In 2023, Chorro Creek bog thistle is still known from 22 occurrences, with 1 of these possibly extirpated (occurrence 7; Table 1). This is an increase of 13 occurrences since the time of listing in 1994. There are many other locations with habitat that have not been searched, in particular on private land, and it is highly likely that additional occurrences will be found. In 2023, all threats identified in the 5-year reviews (Service 2014, entire; 2022, entire) and Kofron and Havlik (2016, entire) still remain. In particular, climate change with severe drought and increased temperatures is a major threat (Williams et al. 2022, entire; Borundu 2022, entire). The combination of all Federal and State laws has only limited ability to protect Chorro Creek bog thistle (Service 2022, p. 10). A summary of the current threats to each occurrence is presented in Table 2.

Recovery Plan Information

Recovery

Chorro Creek bog thistle is listed as Federally endangered, and it can be considered for Federally threatened when the four downlisting criterion are met.

Occurrences from throughout the range of this species, each made up of multiple colonies, and their habitat at six sites are secure from human-induced threats, including water diversions or drawdowns.

At least three of these sites are in protected areas of greater than 40 hectares/100 acres and occurrences are deemed viable and stable or increasing as determined by monitoring over a precipitation cycle that includes multiple years of below average rainfall.

Protected sites are being managed in a way that will support the continued existence of Chorro Creek bog thistle occurrences and their wetland habitats.

Management is effective, as shown by at least 10 years of monitoring.

None of the downlisting criteria have been met (Service 2022, p. 10–11).

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Coachella Valley Milk-Vetch

Listing Status

The Coachella Valley milk-vetch was listed as endangered on October 6, 1998 (63 FR 53596)

Life History and Habitat

The Coachella Valley milk-vetch is restricted to active sand dunes, ephemeral sand fields, stabilized sand fields, and mesquite dunes in the Coachella Valley between Cabazon and Indio. At the time of listing, the distribution was effectively the same as the known historical distribution. However, a large percentage of the sand dune system that was once contiguous through the Coachella Valley has been converted to urban land uses, which has fragmented the sand habitats and compromised the ecosystem processes of sand transport that sustain these habitats (UCR 2022).

The date of first flowering for milk-vetch may be as early as December and continues into May, though most flowering occurs in March and April (Service 2009). The first date of fruit may be as early as February. At maturity, seed pods dry and fall to the ground, where they are dispersed by wind. As such, wind transport corridors between populations facilitate gene flow and population growth. While Coachella Valley milk-vetch is capable of self-pollination through offshoots, seed production is highly dependent on pollinators (Service 2009). Pollinators may include bees in the family Megachilidae and the western honeybee (*Apis mellifera*) (Service 2009). Annual variations in precipitation substantially affect the number of Coachella Valley milk-vetch seeds that may germinate and mature into standing plants that successfully reproduce (Service 2008). Likewise, in perennial individuals that may reproduce via self-pollination, the capacity for dormant root crowns to sprout new shoots is substantially dependent on levels of annual winter rains.

Population Status

Overall, the number of above-ground Coachella Valley milk-vetch plants varies widely from year to year, depending on the environmental conditions, making assessments of total individual numbers difficult. Additionally, detecting changes in population trends over time is difficult because the number of seeds in a given area that germinate and produce standing plants can vary widely depending on environmental conditions. Therefore, the number of standing plants at any given time is only a partial indication of population size because the other portion of the population is the seed bank in the substrate that can persist dormant for a number of years (Service 2009). Abundance may be correlated with sufficient rainfall to germinate seeds and active sand movement to scarify seeds. These conditions are characteristic of active sand dunes and ephemeral sand fields, which support the highest densities of Coachella Valley milk-vetch (UCR 2020).

Numbers also vary by location, with higher numbers found on the ephemeral sand fields within the Whitewater Floodplain Conservation Area south of the Union Pacific railroad and between Indian Canyon Road and Gene Autry Trail, and just west of Windy Point (UCR 2020). Fewer numbers of plants occur farther east on the Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP) Thousand Palms Conservation Area, possibly due to finer sand particles and/or reduced average rainfall (UCR 2020). At habitats with reduced sand movement, including stabilized sand fields and mesquite dunes, this species is much rarer and less predictable in its occurrence (UCR 2022).

Recovery Plan Information

No approved final or draft recovery plan exists for the Coachella Valley milk-vetch. However, the conservation goals for the species outlined in the CVMSHCP (CVAG 2007), which encompasses most of the species' range, are relevant for identifying recovery goals, including permanent protection and management of known populations that will continue to contribute to the recovery and conservation of Coachella Valley milk-vetch.

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Colusa Grass and its Critical Habitat

Listing Status

Colusa grass (*Neostapfia colusana*) was listed as endangered on March 26, 1997 (62 FR 14338). Critical habitat was designated for the Colusa grass on February 10, 2006 (71 FR 7118).

Life History and Habitat

Colusa grass is an annual plant that can be found in vernal pool habitat in the Sacramento and San Joaquin Valleys (USWFS 2005). Colusa grass requires its seeds to be covered by water for approximately three months before seed germination will occur, so it is found more often in deeper pools and stock ponds that hold seasonal water for longer periods of time. The seeds germinate underwater after being immersed for prolonged periods during the rainy season. The seeds can take approximately 3 months to germinate after an initial rain event, which is longer than other related species. Thus, germination typically happens in late spring when little standing water remains in the pool, and flowering begins approximately 3 to 4 weeks later. Colusa grass is an annual plant, so it dies at the end of the summer after dropping its seeds.

Population Status

As of the latest 5-year review in 2008, there were 43 presumed extant occurrences in Yolo, Solano, Merced, and Stanislaus Counties (USFWS 2008). The vast majority of these occurrences were in Stanislaus County (15 occurrences) and Merced County (22 occurrences). Population trends for this species appear to be declining. Colusa grass continues to be threatened by loss of habitat, primarily from urbanization and conversion to agriculture. Fragmentation of habitat also threatens this species. These threats have resulted in a decreasing trend in overall population numbers since this species was initially discovered in 1898.

Critical Habitat

The critical habitat designation for Colusa grass includes seven units encompassing approximately 152,093 acres (71 FR 7118).

The primary constituent elements of critical habitat for Colusa grass are the habitat components that provide (71 FR 7118):

(i) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools described below in paragraph (ii), providing for dispersal and promoting hydroperiods of adequate length in the pools;

(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and nonnative upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes Colusa grass (USFWS 2005).

Recovery Actions

Recovery criteria (USFWS 2005) for this species include the following:

1. Habitat protection: Accomplish habitat protection that promotes vernal pool ecosystem function sufficient to contribute to population viability of the covered species.

   1A. Suitable vernal pool habitat within each prioritized core area for the species is protected.

   1B. Species occurrences distributed across the species geographic range and genetic range are protected. Protection of extreme edges of populations protects the genetic differences that occur there.

   1C. Reintroductions must be carried out and meet success criteria established in the recovery plan.

   1D. Additional occurrences identified through future site assessments, GIS and other analyses, and status surveys that are determined essential to recovery are protected. Any newly found occurrences may count towards recovery goals if the occurrences are permanently protected as described in the recovery plan.

   1E. Habitat protection results in protection of hydrology essential to vernal pool ecosystem function, and monitoring indicates that hydrology that contributes to population viability has been maintained through at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

2. Adaptive Habitat Management and Monitoring:

   2A. Habitat management and monitoring plans that facilitate maintenance of vernal pool ecosystem function and population viability have been developed and implemented for all habitat protected, as previously discussed in Sections 1 (A-E).

   2B. Mechanisms are in place to provide for management in perpetuity and long-term monitoring of habitat protected in Sections 1 (A-E), as previously discussed (funding, personnel, etc.).

   2C. Monitoring indicates that ecosystem function has been maintained in the areas protected under Sections 1 (A-D) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

   2D. Seed banking actions have been completed for species that would require it as insurance against risk of stochastic extirpations or that will require reintroductions or introductions to contribute to meeting recovery criteria.

3. Status Surveys:

   3A. Status surveys, 5-year status reviews, and population monitoring show populations within each vernal pool region where the species occur are viable (e.g., evidence of reproduction and recruitment) and have been maintained (stable or increasing) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

3B. Status surveys, status reviews, and habitat monitoring show that threats identified during and since the listing process have been ameliorated or eliminated. Site-specific threats identified through standardized site assessments and habitat management planning also must be ameliorated or eliminated.

4. Research:

4A. Research actions necessary for recovery and conservation of the covered species have been identified (these are research actions that have not been specifically identified in the recovery actions but for which a process to develop them has been identified). Research actions (both specifically identified in the recovery actions and determined through the process) on species biology and ecology, habitat management and restoration, and methods to eliminate or ameliorate threats have been completed and incorporated into habitat protection, habitat management and monitoring, and species monitoring plans, and refinement of recovery criteria and actions.

4B. Research on genetic structure has been completed (for species where necessary – for reintroduction and introduction, seed banking) and results incorporated into habitat protection plans to ensure that within and among population genetic variation is fully representative by populations protected in the Habitat Protection section of this document, described previously in Sections 1 (A-E).

4C. Research necessary to determine appropriate parameters to measure population viability for each species have been completed.

5. Participation and outreach:

5A. Recovery Implementation Team is established and functioning to oversee rangewide recovery efforts.

5B. Vernal pool regional working groups are established and functioning to oversee regional recovery efforts.

5C. Participation plans for each vernal pool region have been completed and implemented.

5D. Vernal pool region working groups have developed and implemented outreach and incentive programs that develop partnerships contributing to achieving recovery criteria 1-4.

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Vol. 71, No. 28. Federal Register 7118. February 10, 2006. Available online at: https://www.govinfo.gov/content/pkg/FR-2006-02-10/pdf/06-1080.pdf#page=2

Contra Costa Goldfields and its Critical Habitat

Listing Status

The Contra Costa goldfields (*Lasthenia conjugens*) was listed as endangered on June 18, 1997 (62 FR 33029). Critical habitat was designated for the Butte County meadowfoam on February 10, 2006 (71 FR 7118).

Life History and Habitat

The Contra Costa goldfields inhabit vernal pools in open grassy areas at elevations up to 470 m (NatureServe 2015). *Lasthenia conjugens* typically grows in vernal pools, swales, and low depressions in open valley and foothill grasslands and have been found in three types of vernal pools: Northern Basalt Flow, Northern Claypan, and Northern Volcanic Ashflow (Sawyer and Keeler-Wolf 1995). This species is commonly found at elevations less than 61 meters (m) (200 feet (ft)) but has been documented at 445 m (1465ft) in Napa County and at 137 m (450ft) in Monterey County (USFWS 2013).

Seed dispersal mechanisms in *Lasthenia conjugens* are unknown. However, the lack of a pappus or even hairs on the achenes makes wind dispersal unlikely (USFWS 2005).

Lasthenia conjugens flowers from March to June and is self-incompatible (USFWS 2013). Although *L. conjugens* has not been the subject of pollinator studies, observations suggest that the same insects visit all outcrossed species of *Lasthenia*, rather than concentrating on any particular species. Insect visitors to flowers of Lasthenia belong to five orders: Coleoptera, Diptera, Hemiptera (true bugs), Hymenoptera, and Lepidoptera. Most of these insects are generalist pollinators. All of the specialist pollinators of *Lasthenia* are solitary bees (family Andrenidae); these pollinators include two species in the subgenus Diandrena (*Andrena submoesta* and *A. puthua*) and five or six species in the subgenus Hesperandrena (*Andrena baeriae, A. duboisi, A. lativentris*, and two or three undescribed species) (USFWS 2005).

Population Status

Rangewide Status of the Species

Historically, *Lasthenia conjugens* occurred in seven vernal pool regions: Central Coast, Lake-Napa, Livermore, Mendocino, Santa Barbara, Santa Rosa, and Solano-Colusa. In addition, several historical occurrences in Contra Costa County are outside of the defined vernal pool regions. Ornduff reported collections from 13 sites in Alameda, Contra Costa, Mendocino, Napa, Santa Barbara, Santa Clara and Solano counties (Ornduff 1966 in USFWS 2013). Although he cited three specimens each from Contra Costa and Santa Barbara counties, he noted that the species was most common in Solano County. One additional site in Alameda County was documented in 1959 by G. Thomas Robbins, who collected a specimen (# 3963, housed at the Jepson Herbarium) on the “shore of the San Francisco Bay” south of Russell (USFWS 2005; USFWS 2013).

Lasthenia conjugens has been reported in ten counties within California: Alameda, Contra Costa, Marin, Mendocino, Monterey, Napa, Santa Barbara, Santa Clara, Solano, and Sonoma (USFWS 2013).

Population Summary

Of the 23 presumed extant records, four occurrences may now be extirpated: (1) an occurrence in Mendocino County has not been observed since 1937; (2) an occurrence in Alameda County has not been observed since 1959; (3) in 1987, a single plant was observed in Napa County and has not been documented since; (4) an occurrence in Solano County was noted on a field checklist in1996 and the location is unknown. Ramp Neale et al. (2008) found high levels of genetic diversity and moderate levels of differentiation among populations (USFWS 2013).

Threats

Threats to this species include:

- One of the primary threats to *L. conjugens* is conversion of land use, for example residential and industrial development, wetland drainage, and agricultural land conversion (including vineyards) (USFWS 2008). Since 65% of this species occurs on private land and is not protected, this is an ongoing problem (USFWS 2008).
- Inadequacy of existing regulatory mechanisms (USFWS 2013).
- Competition from invasive plant species poses a primary threat to this species. Non-native grasses occur commonly in vernal pool complexes and have become a threat to native vernal pool species through their capacity to change pool hydrology. Non-native grasses maintain dominance at pool edges, sequestering light and soil moisture. *Lolium multiflorum* and *Glyceria declinata* (waxy mannagrass) increase thatch buildup, which leads to increased oxygen depletion in the pools and contributes to the shortening of inundation periods through increased evapotranspiration. As vernal pool complexes become surrounded by residential development and disturbed habitat, the likelihood of invasion by nonnative plants increases (USFWS 2013).
- Both lack of grazing and excessive grazing may cause an increase in organic matter in the habitat that can eliminate the natural vernal pool invertebrate community and promote opportunistic and invasive nonnative species, such as Lolium spp., that outcompete the obligate vernal pool species. The cessation of cattle grazing has been found to exacerbate the negative effects of invasive non-native plants on vernal pool inundation period. Appropriate levels of grazing may help maintain soil conditions and limit the amount of thatch accumulation near vernal pools. Increased grass cover in and around ungrazed pools may lead to an increase in evapotranspiration rates, resulting in a decreased hydroperiod. In areas where long-term grazing has been in effect, moderate grazing (in both stocking numbers and amount of time) may be an important tool in combating non-native plant species, when burning is not an option. Moderate grazing may be a necessary tool to maintain the species diversity of the natural vernal pool ecosystem (USFWS 2013).
- Climate change is another threat to this species.

Five-Year Status Review

There have been two five-year status reviews for this species: one on September 30, 2008, and one on February 21, 2013. The latest five-year status review resulted in no change in listing status (USFWS 2013).

Critical Habitat

The critical habitat designation for *Lasthenia conjugens* includes eight units in Alameda, Contra Costa, Mendocino, Napa, and Solano counties, California. This species critical habitat encompasses approximately 14,730 acres (71 FR 7118).

- Unit 1: Mendocino County, California. From USGS 1:24,000 scale quadrangle Point Arena.
- Unit 2: Napa County, California. From USGS 1:24,000 scale quadrangles Yountville, Capell Valley. Unit 3: Napa County, California. From USGS 1:24,000 scale quadrangles Napa, Cuttings Wharf.

- Unit 4: Solano County, California. (i) Unit 4A: Solano County, California. From USGS 1:24,000 scale quadrangle Fairfield South. (ii) Unit 4B: Solano County, California. From USGS 1:24,000 scale quadrangles Fairfield South. (iii) Unit 4C: Solano County, California. From USGS 1:24,000 scale quadrangles Elmira, Denverton.
- Unit 5: Solano County, California. (i) Unit 5A: Solano County, California. From USGS 1:24,000 scale quadrangle Elmira. (ii) Unit 5B: Solano County, California. From USGS 1:24,000 scale quadrangles Elmira, Denverton.
- Unit 6: Contra Costa County, California. From USGS 1:24,000 scale quadrangle Benicia.
- Unit 7: Contra Costa County, California. From USGS 1:24,000 scale quadrangles Byron Hot Springs, Clifton Court Forebay.
- Unit 8: Alameda County, California. (i) Unit 8A: Alameda County, California. (ii) Unit 8B: Alameda County, California. From USGS 1:24,000 scale quadrangles Milpitas, Niles.

The primary constituent elements of critical habitat for the Contra Costa goldfields (*Lasthenia conjugens*) are the habitat components that provide (71 FR 7118):

(i) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools described below in paragraph (ii), providing for dispersal and promoting hydroperiods of adequate length in the pools;

(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and nonnative upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the Contra Costa goldfields (USFWS 2005).

Recovery Actions

- Protect vernal pool habitat in the largest blocks possible from loss, fragmentation, degradation, and incompatible uses (USFWS 2005).
- Manage, restore, and monitor vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005).
- Conduct range-wide status surveys and status reviews for all species addressed in this recovery plan to determine species status and progress toward achieving recovery of listed species and long-term conservation of species of concern (USFWS 2005).
- Conduct research and use results to refine recovery actions and criteria, and guide overall recovery and long-term conservation efforts (USFWS 2005).
- Develop and implement participation programs (USFWS 2005).

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Cushenbury Buckwheat and its Critical Habitat

Listing Status

Cushenbury buckwheat is a perennial, endemic to the northeastern San Bernardino Mountains extending from Rattlesnake Canyon in the east to White Mountain in the west. The Service listed the species as endangered on August 24, 1994 (67 FR 43652).

Life History and Habitat

Cushenbury buckwheat is a low, densely-matted perennial plant in the Polygonaceae (buckwheat family). The flowers are whitish-cream, darkening to a reddish or purple color with age, and are borne on flowering stalks reaching 4 inches (10 centimeters) in height. The leaves are 0.3 to 0.6 inches (0.8 to 1.5 centimeters) long, round to ovate, and white-woolly on both surfaces. The diameter of mats is typically 6 to 10 inches (15 to 25 centimeters), but they may reach up to 20 inches (51 centimeters) (Service 1994) Three other varieties of *Eriogonum ovalifolium* are distinguished on the basis of floral and leaf characteristics, but none occur in the San Bernardino Mountains (Service 1997).

Population Status

According to the Carbonate Habitat Management Strategy (Olson 2003), 1,213 acres of occupied habitat exist for Cushenbury buckwheat in the action area. We described previous consultations that addressed existing ground disturbance within the Forest in the above general environmental baseline section and under the Cushenbury oxytheca baseline. The potential threats to the species are habitat loss by development, mining, off-highway vehicle activities, and recreational activities.

In 1994, Cushenbury buckwheat had fewer than 20 occurrences in the Forest (Service 2009). Since listing, the Forest Service has mapped 239 site-specific occurrences (Service 2009).

Critical Habitat

The Service designated 6,955 acres of critical habitat for the species on December 24, 2002 (67 FR 78570) on Federal and private lands. The physical and biological features of critical habitat for this species are (1) soils derived from the upper and middle members of the Bird Spring Formation and Bonanza King Formation parental materials that occur on hillsides at elevations between 4,600 and 7,900 feet); (2) soils with intact, natural surfaces that have not been substantially altered by land use activities (e.g., graded, excavated, re-contoured, or otherwise altered by ground-disturbing equipment); and (3) associated plant communities that have areas with an open canopy cover (generally less than 15 percent cover) and little accumulation of organic material (e.g., leaf litter) on the surface of the soil. For more detailed information about the species description, legal/listing status, distribution and population trends, life history, habitat affinities, and the status of critical habitat, please refer to the mentioned Federal Register documents and the 5-year review for this species (Service 2009).

Recovery Plan Information

A final recovery plan has not yet been completed for this species. However, a draft Recovery Plan covering San Bernardino Mountains Carbonate Endemic Plants, which includes Cushenbury buckwheat was created September 1997 (Service 1997). For more information, please see the aforementioned document.

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Cushenbury Milk-Vetch Critical Habitat

Critical Habitat

Cushenbury milk-vetch is a short-lived perennial, endemic to the northern edge of the San Bernardino Mountains. The Service listed the species as endangered on August 24, 1994 (67 FR 43652). Then the Service designated 4,365 acres of critical habitat for the species on December 24, 2002 (67 FR 78570) on Federal and private lands. The physical and biological features of critical habitat for this species are (1) soils derived primarily from the upper and middle members of the Bird Spring Formation and Undivided Cambrian parent materials that occur on dry flats and slopes or along rocky washes with limestone outwash/deposits at elevations between 3,864 and 6,604 feet; (2) soils with intact, natural surfaces that have not been substantially altered by land use activities (e.g., graded, excavated, re-contoured, or otherwise altered by ground-disturbing equipment); and (3) associated plant communities that have areas with an open canopy cover and little accumulation of organic material (e.g., leaf litter) on the surface of the soil. For more detailed information about the species description, legal/listing status, distribution and population trends, life history, habitat affinities, and the status of critical habitat, please refer to the mentioned Federal Register documents and the 5-year review for this species (Service 2009).

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Cushenbury Oxytheca Critical Habitat

Critical Habitat

The Service listed Cushenbury oxytheca as endangered on August 24, 1994 (59 FR 43652). The Service designated approximately 3,150 acres of critical habitat for the species on December 24, 2002 (67 FR 78570) on Federal and private lands. The physical and biological features of critical habitat for this species are (1) soils derived primarily from upslope limestone, a mixture of limestone and dolomite, or limestone talus substrates with parent materials that include Bird Spring Formation, Bonanza King Formation, middle and lower members of the Monte Cristo Limestone, and the Crystal Pass member of the Sultan Limestone Formation at elevations between 4,724 and 7,782 feet; (2) soils with intact, natural surfaces that have not been substantially altered by land use activities (e.g., graded, excavated, re-contoured, or otherwise altered by ground-disturbing equipment); and (3) associated plant communities that have areas with a moderately open canopy cover (generally between 25 and 53 percent). For more detailed information about the species description, legal/listing status, distribution and population trends, life history, habitat affinities, and the status of critical habitat, please refer to the mentioned Federal Register documents and the 5-year review for this species (Service 2009)

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[Service] U.S. Fish and Wildlife Service. 2009d. Cushenbury oxytheca 5-year review: Summary and evaluation. U.S. Fish and Wildlife Service, Region 8, Carlsbad, California. 22 pp. https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=Q36L

Few-flowered Navarretia

Listing Status

The few-flowered Navarretia (*Navarretia leucocephala* ssp. *pauciflora* (= *N. pauciflora*)) was listed as endangered on June 18, 1997 (62 FR 33029). No critical habitat has been designated for the few-flowered Navarretia.

Life History and Habitat

The few-flowered navarretia is extremely rare. This species is dependent on vernal pools for survival and its life history is closely linked to the hydrology of these wetlands. This species is found only on vernal pools on substrates of volcanic origin, specifically in Northern Basalt Flow and Northern Volcanic Ashflow Vernal Pools. Extant localities in Lake County are in "flats" of recent alluvium in mountainous areas; site specific details are not known for Napa County sites (USFWS 2008).

The few-flowered Navarretia inhabits vernal pools with a volcanic ash substrate in chaparral, grassland, or mixed coniferous forest communities (NatureServe 2015).

Population Status

Rangewide Status of the Species

The few-flowered Navarretia is found in Lake and Napa counties, in the Lake-Napa Vernal Pool Region (USFWS 2008).

Population Summary

All occurrences are within an approximately 20-square mile area. The CNDDB reports eight known occurrences of this species; six in Lake County and two in Napa County (USFWS 2008). However, it is difficult to determine the actual number of localities because of some plants exhibit characteristics that are intermediate between the few-flowered navarretia and many-flowered navarretia (*Navarretia leucocephala* ssp. *plieantha*) because some occurrences historically reported have very vague location descriptions and these locations may represent known sites by different names (USFWS 2008).

Only 1-5 populations of the few-flowered Navarretia are known for a total of 1000-2500 individuals of this species (NatureServe 2015).

Threats

Threats to this species include:

- Threats to the habitat of few-flowered navarretia include alteration of hydrology, effects from road maintenance activities, agriculture land conversion, construction of a stock pond, off-road vehicle use, inappropriate grazing regimes, and competition from invasive weedy plant species (USFWS 2008).
- Competition from invasive plant species continues to pose a threat to this species. The localities at Hesse Flat and Manning Flat have been reported to be threatened by invasive plant species such as yellow star thistle (*Centaurea solstitialis*). Although specific information regarding adverse effects from invasive plant species is not available for all sites, it is likely that many of the localities of few-flowered navarretia are currently threatened by invasive plants to some degree. Further research and monitoring are necessary to determine the degree that this species is threatened by non-native invasive plant species (USFWS 2008).
- The small number of localities makes it difficult for this species to persist while sustaining the impacts from competition from nonnative plant species, intensive grazing, changes in hydrology,

adjacent development, drought, or other unknown factors. Such populations may be highly susceptible to extirpation due to chance environmental disturbances. If a locality of few-flowered navarretia has several consecutive years of poor rainfall, intensive grazing, changes in hydrology from adjacent development, or intense competition from other plant species, it is possible that the locality will become extirpated. Populations that decline to zero may not always be capable of rebounding from the soil seed bank and the population is likely to become extirpated (USFWS 2008).

- Climate change is another threat to this species.

Five-Year Status Review

On July 10, 2008, the USFWS issued a five-year status review of the few-flowered Navarretia, which resulted in no change in listing status (USFWS 2008).

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the few-flowered Navarretia (USFWS 2005).

Recovery criteria (USFWS 2005) for this species include the following:

1. Habitat protection: Accomplish habitat protection that promotes vernal pool ecosystem function sufficient to contribute to population viability of the covered species.

    1A. Suitable vernal pool habitat within each prioritized core area for the species is protected.

    1B. Species occurrences distributed across the species geographic range and genetic range are protected. Protection of extreme edges of populations protects the genetic differences that occur there.

    1C. Reintroductions must be carried out and meet success criteria established in the recovery plan.

    1D. Additional occurrences identified through future site assessments, GIS and other analyses, and status surveys that are determined essential to recovery are protected. Any newly found occurrences may count towards recovery goals if the occurrences are permanently protected as described in the recovery plan.

    1E. Habitat protection results in protection of hydrology essential to vernal pool ecosystem function, and monitoring indicates that hydrology that contributes to population viability has been maintained through at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

2. Adaptive Habitat Management and Monitoring:

    2A. Habitat management and monitoring plans that facilitate maintenance of vernal pool ecosystem function and population viability have been developed and implemented for all habitat protected, as previously discussed in Sections 1 (A-E).

    2B. Mechanisms are in place to provide for management in perpetuity and long-term monitoring of habitat protected in Sections 1 (A-E), as previously discussed (funding, personnel, etc.).

2C. Monitoring indicates that ecosystem function has been maintained in the areas protected under Sections 1 (A-D) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

2D. Seed banking actions have been completed for species that would require it as insurance against risk of stochastic extirpations or that will require reintroductions or introductions to contribute to meeting recovery criteria.

3. Status Surveys:

3A. Status surveys, 5-year status reviews, and population monitoring show populations within each vernal pool region where the species occur are viable (e.g., evidence of reproduction and recruitment) and have been maintained (stable or increasing) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

3B. Status surveys, status reviews, and habitat monitoring show that threats identified during and since the listing process have been ameliorated or eliminated. Site-specific threats identified through standardized site assessments and habitat management planning also must be ameliorated or eliminated.

4. Research:

4A. Research actions necessary for recovery and conservation of the covered species have been identified (these are research actions that have not been specifically identified in the recovery actions but for which a process to develop them has been identified). Research actions (both specifically identified in the recovery actions and determined through the process) on species biology and ecology, habitat management and restoration, and methods to eliminate or ameliorate threats have been completed and incorporated into habitat protection, habitat management and monitoring, and species monitoring plans, and refinement of recovery criteria and actions.

4B. Research on genetic structure has been completed (for species where necessary – for reintroduction and introduction, seed banking) and results incorporated into habitat protection plans to ensure that within and among population genetic variation is fully representative by populations protected in the Habitat Protection section of this document, described previously in Sections 1 (A-E).

4C. Research necessary to determine appropriate parameters to measure population viability for each species have been completed.

5. Participation and outreach:

5A. Recovery Implementation Team is established and functioning to oversee rangewide recovery efforts.

5B. Vernal pool regional working groups are established and functioning to oversee regional recovery efforts.

5C. Participation plans for each vernal pool region have been completed and implemented.

5D. Vernal pool region working groups have developed and implemented outreach and incentive programs that develop partnerships contributing to achieving recovery criteria 1-4.

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Fleshy Owl's-Clover and its Critical Habitat

Listing Status

The fleshy owl's-clover (*Castilleja campestris* ssp. *succulenta*) was listed as threatened on March 26, 1997 (62 FR 14338). Critical habitat was designated for the fleshy owl's-clover on February 10, 2006 (71 FR 7118).

Life History and Habitat

Castilleja campestris ssp. *succulenta* is found primarily in vernal pools, and only in the lower rolling foothill areas of the eastern San Joaquin Valley in the Southern Sierra Foothills Vernal Pool Region (USFWS 2005). Soil textures at those sites range from extremely stony loam to loamy clay. At the UC Merced site and the surrounding community planning area, 81.4% of the individual pools where this taxon was found were on Redding gravelly loam, 9.5% were on Corning gravelly sandy loam, 6.4% were on Corning gravelly loam, 1.7% were on Keyes gravelly loam, 0.7% was on Keyes gravelly clay loam, and 0.3% was on Pentz loam (USFWS 2011). Self-pollinating species of Castilleja typically occur as widely scattered individuals, rather than dense colonies (USFWS 2011). Populations of *Castilleja campestris* spp. *succulenta* have been reported from elevations of 24.0 m (80 feet) at the San Joaquin County site to 700.0 m (2,300 feet) at Kennedy Table in Madera County (USFWS 2011; NatureServe, 2015).

Castilleja campestris ssp. *succulenta* is an annual plant. Seeds of the *C. campestris* ssp. *succulenta* do not require the presence of a host to germinate, as they form root connections only after reaching a seedling stage.

Population Status

Rangewide Status of the Species

The historical distribution between 1937 and 1986 was reported from 33 occurrences, all in the Southern Sierra Foothills Vernal Pool Region (USFWS 2011). Sixteen of those occurrences, including the type locality, were in eastern Merced County. Six occurrences each were in Fresno and Madera counties and five others were in Stanislaus County (USFWS 2011).

The fleshy owl's-clover is found primarily in vernal pools along the lower rolling foothill grasslands in the eastern San Joaquin Valley of the Southern Sierra Foothills Vernal Pool Region (USFWS 2011).

Population Summary

At the time of the listing in 1997, there were 36 extant occurrences of *Castilleja campestris* ssp. *succulenta* and currently there are 90 presumed extant occurrences (USFWS 2011). The increase in occurrences is most likely a result of an increased number of surveys. Since the final listing rule, an additional threat to *Castilleja campestris* ssp. *succulenta* is that many of its populations are small in number. A small population size makes a population more vulnerable to extirpation from chance events (USFWS 2011).

Threats

Threats to this species include:

- The 1997 final rule stated that nearly half of the extant *Castilleja campestris* ssp. *succulenta* occurrences are threatened by man-made activities such as urbanization, agricultural land conversion, discing, trampling due to overgrazing, mining, and a proposed road expansion project. The threats presented in the listing rule are still relevant. The habitat of this species has been reduced and fragmented throughout its range and vernal pools continue to be removed by the factors previously noted. Lands on the Central Valley floor are closer to existing cities and agricultural lands than the valley rim, which is steeper, less fertile and more removed from cities. As a result, valley floor vernal pools, along with open rangeland, have been and continue to be favored for urban and agricultural development (USFWS 2011).

- Since the final listing rule, an additional threat to *Castilleja campestris* ssp. *succulenta* is that many of its populations are small in number. A small population size makes a population more vulnerable to extirpation from chance events as noted in the 2005 Recovery Plan.
- This taxon is very cyclical and is somewhat scarce in normal or below normal rainfall years but large populations may be evident in wet years at the known sites (USFWS 2011).
- Climate change is another threat to this species.

Five-Year Status Review

On September 8, 2011, the USFWS issued a five-year status review of the fleshy owl's-clover, which resulted in no change in listing status (USFWS 2011).

Critical Habitat

Critical habitat was designated for the fleshy owl's-clover on February 10, 2006 (71 FR 7118). The critical habitat designation for *Castilleja campestris* ssp. *succulenta* includes six units (some with multiple parts) in Fresno, Madera, Mariposa, Merced, San Joaquin, Stanislaus, and Tuolumne counties, California. This species critical habitat encompasses approximately 175,873 acres (71 FR 7118).

- Unit 1: Sacramento and San Joaquin counties, California. From USGS 1:24,000 scale quadrangles Clay and Lockeford.
- Unit 2: Tuolumne and Stanislaus counties, California. From USGS 1:24,000 scale quadrangles Keystone, La Grange, Cooperstown and Paulsell.
- Unit 3: Mariposa and Merced counties, California. (i) Unit 3A: Mariposa and Merced counties, California. From USGS 1:24,000 scale quadrangles Merced Falls and Snelling.
- Unit 3B: Mariposa and Merced counties, California. From USGS 1:24,000 scale quadrangles Merced Falls, Snelling, Indian Gulch, Haystack Mountain, Yosemite Lake, Winton, Owen's Reservoir, Planada and Merced.
- Unit 4: Madera and Merced counties, California. (i) Unit 4A: Madera and Merced counties, California. From USGS 1:24,000 scale quadrangle Raynor Creek.
- Unit 4C: Madera and Fresno counties, California. From USGS 1:24,000 scale quadrangles Millerton Lake West, Little Table Mountain, Daulton, Friant, Lanes Bridge and Gregg.
- Unit 5: Fresno County, California. (i) Unit 5A: Fresno County, California. From USGS 1:24,000 scale quadrangles Friant and Round Mountain.
- Unit 5B: Fresno County, California. From USGS 1:24,000 scale quadrangle Clovis.
- Unit 6: Fresno County, California. (i) Unit 6A: Fresno County, California. From USGS 1:24,000 scale quadrangles Millerton Lake East and Academy.
- Unit 6B: Madera County, California. From USGS 1:24,000 scale quadrangles North Fork and Millerton Lake East.

Primary constituent elements (PCEs) are the physical and biological features of critical habitat essential to a species' conservation. The primary constituent elements of critical habitat for *Castilleja campestris* ssp. *succulenta* (Fleshy owl's-clover) are the habitat components that provide:

(i) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools described in paragraph (ii) of this section, providing for dispersal and promoting hydroperiods of adequate length in the pools; and

(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and nonnative upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the fleshy owl's-cover (USFWS 2005).

Recovery Actions

- Conduct standardized vernal pool habitat site assessments for both the Southeastern Sacramento Valley and Southern Sierra Foothills vernal pool regions (USFWS 2011).
- Establish management and monitoring plans which include criteria for frequent surveys in order to capture the blooming period for this species. The *Castilleja campestris* ssp. *succulenta* population numbers vary widely from year to year depending on habitat conditions and rainfall (Vollmar 2002). Therefore, the Service should encourage bank owners and preserve managers to perform surveys on a frequent schedule in order to gather additional data which will increase knowledge. The additional information will be utilized for future 5-year reviews (USFWS 2011).
- The Vernal Pool Regional working group should formulate a plan to reach out and educate private landowners as to the value of federally-listed species on their lands, with a particular focus on plants. The Vernal Pool Regional group also should provide guidance to assist landowners on how to better manage their lands for the overall benefit of this species (USFWS 2011).
- The Service should encourage collection of seeds and storage in approved seed banks from extant occurrences, in each core area, to aid in the establishment of a seed bank (USFWS 2011).
- The Service should encourage County and local governments to consider developing Habitat Conservation Plans (HCPs) to include vernal pool species. Take of a federally-listed invertebrate species would be permitted on private land, and any habitat acquisition to compensate for invertebrate species could include the *Castilleja campestris* ssp. *succulenta* if appropriate. Fresno County has been awarded Federal funds for the development of an HCP and additional funds may be available in the future for counties who apply for them (USFWS 2011).
- Efforts to protect vernal pool species should include conservation efforts on a landscape scale (Vollmar 2002). Landscape Conservation Cooperatives provide Federal scientific and technical support for conservation on a landscape scale which is the entire range of an identified priority species. These cooperatives also have a role in helping partners identify common goals and priorities to target the right science for efficient and effective conservation (USFWS 2011).

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Gentner's Fritillary

Listing Status

Gentner's fritillary was listed as an endangered species on December 10, 1999 (USDI FWS 1999). Critical habitat has not been designated for this species.

Life History and Habitat

Gentner's fritillary is a member of the lily family (Liliaceae) and is a perennial herb arising from a fleshy bulb (USDI FWS 2003b). Nonflowering individuals vastly outnumber flowering plants in natural populations, and are recognizable only by their single basal leaves, which appear virtually identical to those of other co-occurring *Fritillaria* species. Flowering Gentner's fritillary plants have been determined to constitute approximately 3 percent of any given population of all age-classes (Siskiyou BioSurvey 2011; Gray *et al.* 2011). In some years this has been documented to be as low at 0.5 percent of the population (Gray *et al.* 2011). Accurate identification of Gentner's fritillary is only accomplished with flowering individuals.

Gentner's fritillary occurs at elevations ranging from 839 to 4,231 feet above sea level, but some variation likely exists, and the species may occur at elevations outside this range. The species is often found in grassland and chaparral habitats within, or on the edge of, dry, open woodlands. It is often associated with shrubs where it is somewhat protected from the effects of wind and sun. Although it often occupies ridge-line ecotones, it is not found on fully exposed sites or extremely dry sites (USDI FWS 1999). The overstory habitat for Gentner's fritillary is open oak, mixed conifer woodland, and forest edges. These habitats are typified by buck brush (*Ceanothus cuneatus*), white-leaved manzanita (*Arctostaphylos viscida*), snow brush (*Ceanothus velutinus*), mountain mahogany (*Cercocarpus betuloides*) and poison oak (*Toxicodendron diversiloba*) in the shrub layer and Pacific madrone (*Arbutus menziesii*), incense cedar (*Calocedrus decurrens*), Oregon white oak (*Quercus garryana*), California black oak (*Quercus kelloggii*) ponderosa pine (*Pinus ponderosa*), and Douglas-fir (*Pseudotsuga menziesii*) in the tree layer.

Gentner's fritillary habitat is benefitted by some form of periodic disturbance and is best maintained in earlier successional forest vegetation stages. Although expert opinions vary on the importance of disturbance regimes, burning and thinning may benefit the species by dispersing bulbs, creating openings, and reducing encroachment of shrubs and trees (USDI FWS 2003b).

Population Status

Gentner's fritillary is known from 96 occurrence clusters which include 14 experimental introduction sites, totaling approximately 1,150 acres in size, scattered across three counties (Siskiyou County, California, and Jackson and Josephine Counties, Oregon) (USDI FWS 2003b; USDI FWS 2012b). Gentner's fritillary populations in California represent the southernmost extent of their range. This species is found primarily in very small, scattered occurrences (USDI FWS 1999). While suitable habitat for Gentner's fritillary exists within the project area, we have no information on the status of populations that may be affected by project actions.

Recovery Plan Information

The recovery plan for Gentner's fritillary was released in August, 2003 (USDI FWS 2003b). Recovery of Gentner's fritillary will be based on the conservation of the species through protected populations (''Fritillaria management areas'') distributed in natural densities across the historical range of the species in four designated recovery units (USDI FWS 2003b). Recovery units are geographic, or otherwise identifiable subunits that are essential to the species' survival and recovery (i.e., considered individually necessary to the long-term viability of the species through the preservation of such factors as genetic or demographic robustness) (USDI FWS 2003b). Currently, no individuals of Gentner's fritillary are known to occur beyond a distance of 9.3 miles of a population center (USDI FWS 2003b). Therefore, recovery units were delineated by drawing a 9.3-mile radius circle around identified population centers, or any area where four or more known locations occurred within 0.3 miles of each other. Where concentric circles intersected, the circles were joined to form a single recovery unit.

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Greene's Tuctoria and its Critical Habitat

Listing Status

Greene's tuctoria (*Tuctoria greenei*) was listed as endangered on March 26, 1997 (62 FR 14338). Critical habitat was designated for Greene's tuctoria on February 10, 2006 (71 FR 7118).

Life History and Habitat

Greene's tuctoria is endemic to vernal pools. The species is typically found along the edges of deeper vernal pools instead of in the deeper portions of the pools (USFWS 2005). The seeds germinate underwater approximately 2 months after an initial rain event fills the pool. The species is much less tolerant of inundation than similar species, and the plants will die if late spring rains refill pools that had previously dried up. Greene's tuctoria is an annual plant, so it dies at the end of the summer after dropping its seeds.

As of the latest 5-year review in 2007, Greene's tuctoria was known from 42 localities in 10 counties: Shasta, Tehama, Butte, Glenn, San Joaquin, Stanislaus, Madera, Merced, Fresno, and Tulare (USFWS 2007).

Population Status

Of the 42 localities known in 2007, only 21 localities were presumed to be extant (USFWS 2007). This species is believed to be extirpated from San Joaquin, Stanislaus, Madera, Fresno, and Tulare counties. These extirpations occurred primarily from conversion of habitat to agriculture and intensive grazing regimes. The largest concentration of the presumed extant localities are located in the Vina Plains area, in Tehama and Butte counties, where 11 localities are presumed extant. The next largest concentration of localities is in eastern Merced County, where five localities are presumed extant.

Critical Habitat

The critical habitat designation for Greene's tuctoria includes eight units encompassing approximately 58,727 acres (71 FR 7118).

The primary constituent elements of critical habitat for Greene's tuctoria are the habitat components that provide (71 FR 7118):

- (i) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools described below in paragraph (ii), providing for dispersal and promoting hydroperiods of adequate length in the pools;
- (ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and nonnative upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes Greene's tuctoria (USFWS 2005).

Recovery Actions

Recovery criteria (USFWS 2005) for this species include the following:

6. Habitat protection: Accomplish habitat protection that promotes vernal pool ecosystem function sufficient to contribute to population viability of the covered species.

    1A. Suitable vernal pool habitat within each prioritized core area for the species is protected.

    1B. Species occurrences distributed across the species geographic range and genetic range are protected. Protection of extreme edges of populations protects the genetic differences that occur there.

    1C. Reintroductions must be carried out and meet success criteria established in the recovery plan.

    1D. Additional occurrences identified through future site assessments, GIS and other analyses, and status surveys that are determined essential to recovery are protected. Any newly found occurrences may count towards recovery goals if the occurrences are permanently protected as described in the recovery plan.

    1E. Habitat protection results in protection of hydrology essential to vernal pool ecosystem function, and monitoring indicates that hydrology that contributes to population viability has been maintained through at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

7. Adaptive Habitat Management and Monitoring:

    2A. Habitat management and monitoring plans that facilitate maintenance of vernal pool ecosystem function and population viability have been developed and implemented for all habitat protected, as previously discussed in Sections 1 (A-E).

    2B. Mechanisms are in place to provide for management in perpetuity and long-term monitoring of habitat protected in Sections 1 (A-E), as previously discussed (funding, personnel, etc.).

    2C. Monitoring indicates that ecosystem function has been maintained in the areas protected under Sections 1 (A-D) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

    2D. Seed banking actions have been completed for species that would require it as insurance against risk of stochastic extirpations or that will require reintroductions or introductions to contribute to meeting recovery criteria.

8. Status Surveys:

    3A. Status surveys, 5-year status reviews, and population monitoring show populations within each vernal pool region where the species occur are viable (e.g., evidence of reproduction and recruitment) and have been maintained (stable or increasing) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

3B. Status surveys, status reviews, and habitat monitoring show that threats identified during and since the listing process have been ameliorated or eliminated. Site-specific threats identified through standardized site assessments and habitat management planning also must be ameliorated or eliminated.

9. Research:

4A. Research actions necessary for recovery and conservation of the covered species have been identified (these are research actions that have not been specifically identified in the recovery actions but for which a process to develop them has been identified). Research actions (both specifically identified in the recovery actions and determined through the process) on species biology and ecology, habitat management and restoration, and methods to eliminate or ameliorate threats have been completed and incorporated into habitat protection, habitat management and monitoring, and species monitoring plans, and refinement of recovery criteria and actions.

4B. Research on genetic structure has been completed (for species where necessary – for reintroduction and introduction, seed banking) and results incorporated into habitat protection plans to ensure that within and among population genetic variation is fully representative by populations protected in the Habitat Protection section of this document, described previously in Sections 1 (A-E).

4C. Research necessary to determine appropriate parameters to measure population viability for each species have been completed.

10. Participation and outreach:

5A. Recovery Implementation Team is established and functioning to oversee rangewide recovery efforts.

5B. Vernal pool regional working groups are established and functioning to oversee regional recovery efforts.

5C. Participation plans for each vernal pool region have been completed and implemented.

5D. Vernal pool region working groups have developed and implemented outreach and incentive programs that develop partnerships contributing to achieving recovery criteria 1-4.

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Hairy Orcutt Grass and its Critical Habitat

Listing Status

The hairy Orcutt grass (*Orcuttia pilosa*) was listed as endangered on March 26, 1997 (62 FR 14338). Critical habitat was designated for the hairy Orcutt grass on February 10, 2006 (71 FR 7118).

Life History and Habitat

This species grows in vernal pools occurring on the eastern side of the Central Valley. The plant germinates underwater and blooms after dry down (NatureServe 2015).

Other members of the genus are known to be wind pollinated and dispersed by water (floating) and adhering to fur and feet with the sticky exudate. Given the close similarity of congeners, it is likely *Orcuttia pilosa* does the same. *O. pilosa* germinates in standing water and flowers after the pool bottom is dry. *O. pilosa* is often the only living plant remaining in the dry and cracked vernal pool bed in late summer. This species appears to need fairly constant water levels during the winter. This seems to limit distribution more than the size of the vernal pool. *O. pilosa* seem to be poor competitors. Cocklebur (*Xanthum* spp.) competes directly by shading. In some years cocklebur forms 100% cover during the peak of *O. pilosa*. The hairy Orcutt grass may tolerate light to moderate grazing. Plants require a well-developed soil. Habitat creation is probably impossible because of soil requirements (NatureServe 2015).

Population Status

Rangewide Status of the Species

Orcuttia pilosa occurs over a 490-km stretch on the eastern margin of the San Joaquin and Sacramento Valleys from Tehama County south through Merced and Mariposa counties, California (NatureServe 2015).

Population Summary

Of 36 occurrences of *Orcuttia pilosa*, 12 are known to be extirpated, 9 are of unknown condition, and only 6 are considered stable (NatureServe 2015).

Threats

Threats (USFWS 2009) to this species include:

1. Urbanization.
2. Agricultural conversion.
3. Highway expansion.
4. Off-road vehicle use.
5. Livestock grazing (and trampling).
6. Invasive plants.
7. Inadequacy of existing regulatory mechanisms.
8. Drought and climate change.

Five-Year Status Review

On June 15, 2009, the USFWS issued a five-year status review of the hairy Orcutt grass, which resulted in no change in listing status (USFWS 2009).

Critical Habitat

Critical habitat was designated for the hairy Orcutt grass on February 10, 2006 (71 FR 7118). The critical habitat designation for *Orcuttia pilosa* is in Butte, Fresno, Madera, Mariposa, Merced, Stanislaus, and Tehama counties, California. This species critical habitat encompasses approximately 79,608 acres (71 FR 7118).

- Unit 1: Tehama County, California. From USGS 1:24,000 topographic quadrangles Acorn Hollow and Richardson Springs NW.
- Unit 2: Butte County, California. From USGS 1:24,000 topographic quadrangle Hamlin Canyon.
- Unit 4: Merced, Mariposa, and Stanislaus counties, California. (i) Unit 4A: Merced, Mariposa, and Stanislaus counties, California. From USGS 1:24,000 topographic quadrangles Paulsell, Cooperstown, Le Grange, Montpelier, Turlock Lake, Snelling, and Merced Falls. (ii) Unit 4B: Stanislaus County, California. From USGS 1:24,000 topographic quadrangles Paulsell and Montpelier. (iii) Unit 4C: Merced County, California. From USGS 1:24,000 topographic quadrangle Turlock Lake.
- Unit 5: Madera County, California. (i) Unit 5A: Madera County, California. From USGS 1:24,000 topographic quadrangle Daulton. Unit 5B: Madera County, California. From USGS 1:24,000 topographic quadrangle Daulton.
- Unit 6: Madera County, California. From USGS 1:24,000 topographic quadrangles Daulton, Little Table Mountain, Gregg, and Lanes Bridge.

Primary constituent elements (PCEs) are the physical and biological features of critical habitat essential to a species' conservation. The primary constituent elements of critical habitat for the hairy Orcutt grass (*Orcuttia pilosa*) are the habitat components that provide:

(i) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools described in paragraph (ii) of this section, providing for dispersal and promoting hydroperiods of adequate length in the pools; and

(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and nonnative upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the hairy Orcutt grass (USFWS 2005).

Recovery Actions

Recovery criteria (USFWS 2005) for this species include the following:

11. Habitat protection: Accomplish habitat protection that promotes vernal pool ecosystem function sufficient to contribute to population viability of the covered species.

    1A. Suitable vernal pool habitat within each prioritized core area for the species is protected.

1B. Species occurrences distributed across the species geographic range and genetic range are protected. Protection of extreme edges of populations protects the genetic differences that occur there.

1C. Reintroductions must be carried out and meet success criteria established in the recovery plan.

1D. Additional occurrences identified through future site assessments, GIS and other analyses, and status surveys that are determined essential to recovery are protected. Any newly found occurrences may count towards recovery goals if the occurrences are permanently protected as described in the recovery plan.

1E. Habitat protection results in protection of hydrology essential to vernal pool ecosystem function, and monitoring indicates that hydrology that contributes to population viability has been maintained through at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

12. Adaptive Habitat Management and Monitoring:

2A. Habitat management and monitoring plans that facilitate maintenance of vernal pool ecosystem function and population viability have been developed and implemented for all habitat protected, as previously discussed in Sections 1 (A-E).

2B. Mechanisms are in place to provide for management in perpetuity and long-term monitoring of habitat protected in Sections 1 (A-E), as previously discussed (funding, personnel, etc.).

2C. Monitoring indicates that ecosystem function has been maintained in the areas protected under Sections 1 (A-D) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

2D. Seed banking actions have been completed for species that would require it as insurance against risk of stochastic extirpations or that will require reintroductions or introductions to contribute to meeting recovery criteria.

13. Status Surveys:

3A. Status surveys, 5-year status reviews, and population monitoring show populations within each vernal pool region where the species occur are viable (e.g., evidence of reproduction and recruitment) and have been maintained (stable or increasing) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

3B. Status surveys, status reviews, and habitat monitoring show that threats identified during and since the listing process have been ameliorated or eliminated. Site-specific threats identified through standardized site assessments and habitat management planning also must be ameliorated or eliminated.

14. Research:

4A. Research actions necessary for recovery and conservation of the covered species have been identified (these are research actions that have not been specifically identified in the recovery actions but for which a process to develop them has been identified). Research actions (both specifically identified in the recovery actions and determined through the process) on species biology and ecology, habitat management and restoration, and methods to eliminate or ameliorate threats have been completed and incorporated into habitat protection, habitat management and monitoring, and species monitoring plans, and refinement of recovery criteria and actions.

4B. Research on genetic structure has been completed (for species where necessary – for reintroduction and introduction, seed banking) and results incorporated into habitat protection plans to ensure that within and among population genetic variation is fully representative by populations protected in the Habitat Protection section of this document, described previously in Sections 1 (A-E).

4C. Research necessary to determine appropriate parameters to measure population viability for each species have been completed.

15. Participation and outreach:

5A. Recovery Implementation Team is established and functioning to oversee rangewide recovery efforts.

5B. Vernal pool regional working groups are established and functioning to oversee regional recovery efforts.

5C. Participation plans for each vernal pool region have been completed and implemented.

5D. Vernal pool region working groups have developed and implemented outreach and incentive programs that develop partnerships contributing to achieving recovery criteria 1-4.

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Hoover's Spurge and its Critical Habitat

Listing Status

The Hoover's spurge (*Chamaesyce hooveri*) was listed as threatened on March 26, 1997 (62 FR 14338). Critical habitat was designated for the Hoover's spurge on February 10, 2006 (71 FR 7118).

Life History and Habitat

Chamaesyce hooveri is restricted to vernal pools. Deeper pools apparently provide better habitat for this species because the duration of inundation is longer and the deeper portions are nearly devoid of other vegetation, thus limiting competition from other plants. However, the plant appears to be adapted to a wide variety of soils that range in texture from clay to sandy loam (USFWS 2005).

Chamaesyce hooveri is a summer annual, but few details of its life history are known. Populations in Merced and Tulare Counties typically flower from late May through July, whereas those farther north in Stanislaus County and the Sacramento Valley flower from mid-June into October. Beetles (order Coleoptera), flies (order Diptera), bees and wasps (order Hymenoptera), and butterflies and moths (order Lepidoptera) have been observed visiting the flowers of *Chamaesyce hooveri* and may potentially serve as pollinators (USFWS 2005).

Population Status

<u>*Rangewide Status of the Species*</u>

For decades, *Chamaesyce hooveri* was known from only three localities: near Yettem and Visalia in Tulare County and near Vina in Tehama County. Collections were made from these three areas in the late 1930s and early 1940s. From 1974 through 1987, 21 additional occurrences of *C. hooveri* were reported. The majority of these (15) were in Tehama County. One to three occurrences were discovered during this period in each of Butte, Merced, Stanislaus, and Tulare counties. The historical localities for this species were in the Northeastern Sacramento Valley, San Joaquin Valley, Solano-Colusa, and Southern Sierra Foothills Vernal Pool Regions (USFWS 2005).

Of the 27 occurrences presumed to be extant, only 3 have been observed within the past decades. The main remaining area of concentration for *Chamaesyce hooveri* is within the Northeastern Sacramento Valley Vernal Pool Region. The Vina Plains of Tehama and Butte Counties contain 15 (56 percent) of the 27 known extant occurrences for *C. hooveri* in an area of about 91 square kilometers (35 square miles). One other site in the same region is near Chico in Butte County. Seven of the extant occurrences are in the Southern Sierra Foothills Vernal Pool Region, including five in the Visalia-Yettem area of Tulare County and two in the Hickman-La Grange area of Stanislaus County. Three other occurrences are on the Sacramento National Wildlife Refuge in Glenn County, which is in the Solano-Colusa Vernal Pool Region. The one other extant occurrence is on the Bert Crane Ranch in Merced County, which is within the San Joaquin Valley Vernal Pool Region (USFWS 2005).

<u>*Population Summary*</u>

The Sacramento National Wildlife Refuge populations have been monitored annually since 1992. *Chamaesyce hooveri* is known to have occurred in 11 pools on the Refuge between 1992 and 2006. It is not seen in all the pools every year. In 2006, it was observed in 4 pools totaling over 1,200 plants. Population numbers have ranged from less than 100 plants seen in 2001 to over 2,500 plants seen in 1993 (USFWS 2009). Of the 31 known occurrences and sites, 27 are presumed to be extant (USFWS 2009).

<u>*Threats*</u>

Threats to this species include:

- Habitat loss occurs from direct destruction and modification of pools due to filling, grading, discing, leveling, paving, and other activities, as well as modification of surrounding uplands, which alters vernal pool watersheds and the supporting upland ecosystem. Fifty-five percent of presumed extant sites of *C. hooveri* are on private land and are not protected (USFWS 2009).
- During the 30 years prior to listing, agricultural land conversion was known to have caused the extirpation of one population and threatened two more populations of *C. hooveri* in Tulare County (USFWS 2009).
- Vernal pool habitats in the Central Valley now represent approximately 9 percent of their former area, and remaining habitats are considerably more fragmented and isolated than historically and during the recent past (USFWS 2009).
- Competition from invasive native or non-native plant species threatens nine of the extant occurrences, including eight in the Vina Plains and one on the Sacramento National Wildlife Refuge in Glenn County (USFWS 2009).
- *Chamaesyce hooveri* is an obligate wetland species found only in vernal pools, typically on alluvial fans or terraces of ancient rivers or streams, with a few on the rim of the Central Valley basin. Therefore, maintenance of the natural hydrology of the pools is necessary for the survival and recovery of this species. Drought or flood conditions will place additional strains on the vernal pool ecosystem supporting *C. hooveri* occurrences, some of which are already fragmented or reduced by agricultural conversion and development. Where occurrences persist on only marginal habitat, the addition of extreme drought conditions is likely to result in higher rates of mortality in the short term with the effects of low reproductive output and survivorship persisting after the drought has ceased (USFWS 2009).
- Small population size poses a serious threat for at least four of the known occurrences, which total fewer than 100 individuals even in favorable years (USFWS 2009). Such small populations are subject to extirpation from random events such as extended drought and genetic drift. Small population size makes it difficult for this species to persist while sustaining the impacts of habitat fragmentation. Such populations may be highly susceptible to extirpation due to chance events, inbreeding depression, or additional environmental disturbance (USFWS 2009).

Five-Year Status Review

On February 4, 2009, the USFWS issued a five-year status review of the Hoover's spurge, which resulted in no change in listing status (USFWS 2009).

Critical Habitat

Critical habitat was designated for the Hoover's spurge on February 10, 2006 (71 FR 7118). The critical habitat designation for *Chamaesyce hooveri* includes seven units in Merced, Stanislaus, Tehama, Tulare, and Tuolumne counties, California. This species critical habitat encompasses approximately 114,713 acres (46,423 hectares) (71 FR 7118).

- Unit 1: Tehama County, California. From USGS 24,000 topographic quad Acorn Hollow, Richardson Springs NW.
- Unit 2: Butte County, California. From USGS 24,000 topographic quad Hamlin Canyon.
- Unit 4: Stanislaus and Tuolumne counties.
- Unit 5: Stanislaus and Merced counties. (i) Unit 5A: Stanislaus and Merced counties. From USGS 24,000 topographic quads Paulsell, Cooperstown, Le Grange, Montpelier, Turlock Lake,

Snelling, Merced Fall. (ii) Unit 5B: Merced County. From USGS 24,000 topographic quad Turlock Lake. (iii) Unit 5C: Stanislaus County. From USGS 24,000 topographic quads Paulsell, Montpelier.

- Unit 6: Merced County. (i) Unit 6A: Merced County. USGS 24,000 topographic quads Stevinson, San Luis Ranch. Unit 6B: Merced County. From USGS 24,000 topographic quad Stevinson, Arena, San Luis Ranch, Turner Ranch. Unit 6C: Merced County. From USGS 24,000 topographic quad Arena, Turner Ranch. Unit 6D: Merced County. USGS 24,000 topographic quad Turner Ranch, Sandy Mush. Unit 6E: Merced County. USGS 24,000 topographic quad Turner Ranch, Sandy Mush.
- Unit 7: Tulare County. (i) Unit 7A: Tulare County. From USGS 24,000 topographic quads Stokes Mtn., Ivanhoe. (ii) Unit 7B: Tulare County. From USGS 24,000 topographic quads Ivanhoe. (iii) Unit 7C: Tulare County. From USGS 24,000 topographic quads Stokes Mtn., Auckland, Ivanhoe, Woodlake. Unit 7D: Tulare County. From USGS 24,000 topographic quad Woodlake. Unit 7E: Tulare County. From USGS 24,000 topographic quad Monson. Unit 7F: Tulare County. USGS 24,000 topographic quad Monson. Unit 7G: Tulare County. USGS 24,000 topographic quad Monson.
- Unit 3 (excluded): Glenn and Colusa counties, California. This unit was excluded from the designation pursuant to Section 4(b)(2) of the Act (see Exclusions under 4(b)(2) in the final critical habitat rule (70 FR 46924).

Primary constituent elements (PCEs) are the physical and biological features of critical habitat essential to a species' conservation. The PCEs of *Chamaesyce hooveri* critical habitat consists of two components (71 FR 7118).

(i) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools described below in paragraph (ii), providing for dispersal and promoting hydroperiods of adequate length in the pools;

(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and nonnative upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the Hoover’s spurge (USFWS 2005).

Recovery Actions

- Protect vernal pool habitat from being destroyed or modified by development, agriculture, or other activities. Acquiring conservation easements or fee title to habitat lands are some ways that conservators can help guarantee protection of the species in perpetuity (USFWS 2009).
- Develop standardized population trend survey protocols and implement to complete updated status surveys, especially for populations on private lands where trends have not been recently updated (USFWS 2009).

- Manage invasive plants on preserves. Management should include research to determine effective eradication methods of nonnative competitors, and pool conditions that favor one plant over another (USFWS 2009).
- Create and convene regional vernal pool working groups in regions where *Chamaesyce hooveri* occurs. Regional vernal pool working groups will be important for the tracking the progress of recovery efforts, including the amount of suitable habitat protected for each of the species in the core areas (USFWS 2009).
- Collect seeds from each core area following the Center for Plant Conservation Guidelines (1991). Seed collections should be stored in at least two sites, including the National Center for Genetic Resources in Fort Collins, Colorado, and a facility certified by the Center for Plant Conservation (USFWS 2009).

Literature Cited

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Howell's Spineflower

Listing Status

Howell's spineflower (*Chorizanthe howellii*) was listed as endangered on June 22, 1992 (57 FR 27848-27859).

Life History and Habitat

Howell's spineflower is an herbaceous annual member of the buckwheat family (Polygonaceae), endemic to the coastal dunes extending from the City of Fort Bragg north to the Ten Mile River, Mendocino County, California. Most of the distribution occurs within MacKerricher State Park. Howell's spineflower may grow to 4 inches tall and 20 inches across, with heads of tiny flowers ranging up to 0.2 inch long that bloom between May and July.

Seed dispersal by Howell's spineflower is facilitated by the floral spines, which attach to passing animals. The species prefers vegetation gaps or sparsely vegetated areas relatively free from other competing species. It occurs in several vegetation alliances associated with semi-stabilized near-shore dunes and backdunes. It also occurs in disturbed areas of coastal prairie, on relatively fertile, finer-textured soils associated with some of the coastal bluffs in the south portion of MacKerricher State Park (Imper 2005; Pickart and Barbour 2007; Sawyer et al. 2009). Its habitat is generally characterized as early successional.

Population Status

Howell's spineflower is limited to a seven-mile stretch of coastline in Mendocino county. The most recent mapping for the distribution of Howell's spineflower on MacKerricher State Park occurred in April 2018. This mapping effort recorded 15.5 acres of occupied habitat, which was an increase of 1.5 acres compared to the previous mapping effort in 2011. In 2019, the Service conducted a population estimate by collecting density data in random meter square plots within occupied habitat (as mapped in 2018). This yielded an estimated abundance of approximately 2 million plants (Service 2019). This is an increase from the estimate of approximately 1.7 million in 2011 (Service 2011).

Recovery Plan Information

The Seven Coastal Plants and the Myrtle's Silverspot Butterfly Recovery Plan was issued on September 29, 1998. Recovery actions for Howell's spineflower include restoration of habitat at MacKerricher State Park and vicinity and expansion of populations into restored habitat.

Literature Cited

Imper, D.K. 2005. U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata, California. Personal observations and field notes, MacKerricher State Park and environs.

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Ione Buckwheat

Listing Status

The Service listed Ione buckwheat as endangered on May 26, 1999 (Service 1999, p. 28403).

Life History and Habitat

Ione buckwheat is a perennial plant that grows upright and reaches 8 to 20 centimeters (3 to 8 inches) in height. Its leaves are smooth, round to oval, and 3 to 10 millimeters (0.1 to 0.4 inches) wide. The plant produces small white flowers from July to October. Ione buckwheat is typically found growing interspersed within populations of Ione manzanita (Service 1999, p. 28404).

Ione buckwheat is rare and occurs in a patchy distribution wherever openings in the shrub community exist. Flowering occurs chiefly from May to October, though flowers may be found on individual plants at any season of the year (Myatt 1970, pp. 320–321). Ione buckwheat is a prolific seeder. The seeds drop from the plant along with the dried calyx; the calyx allows for limited seed dispersion via floatation on surface runoff (Myatt 1987, p. 574).

The plant continues to be threatened by mining, road construction, development, and disease.

Population Status

Ione buckwheat is a rare plant. It is known only from an approximate 16-kilometer (km) (10-mile) stretch along the Ione Formation in western Amador County. All historical and current occurrences are between the village of Buena Vista in the south and Highway 16 in the north (CNDDB 2008). At the time of listing, it was suggested that the range of Ione buckwheat may extend to cover portions of Sacramento County (Service 1999, p. 28406); however, surveys conducted in 2001 placed all plants in Amador County (Service 2005, p. 15).

Recovery Plan Information

While a Recovery Plan for Ione buckwheat has not been published, the Service has initiated work on a draft Recovery Plan for this species. Recommended actions for this species were provided in the 5-year review, including (1) identify the status of Ione buckwheat populations (2) obtain an accurate representation of the area occupied by this species and the availability of habitat for restoration purposes (Service 2010).

Literature Cited

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[Service] U.S. Fish and Wildlife Service. 2010. *Eriogonum apricum* (inclusive of vars. *apricum* and *prostratum*) (Ione Buckwheat = Irish Hill Buckwheat) and *Arctostaphylos myrtifolia* (Ione Manzanita) Five-Year Review, U.S. Fish and Wildlife Service, Sacramento, California. Available online at: https://ecos.fws.gov/docs/five_year_review/doc3560.pdf

Ione Manzanita

Listing Status

The Service listed Ione manzanita as threatened on May 26, 1999 (Service 1999, p. 28403).

Life History and Habitat

Ione manzanita is the dominant and characteristic species of Ione chaparral, where it occurs in pure stands. It is an evergreen shrub and can be distinguished from other species of manzanita by its smaller stature and the color of its leaves. Ione manzanita appears as a low and spreading shrub that typically reaches a height of less than 1.2 meters (3.9 feet). The shrub's bark is red, smooth and waxy with narrowly elliptic olive-green leaves 5 to 15 mm (0.2 to 0.6 inches) long. The white or pinkish urn-shaped flowers appear from January to February with cylindrical fruit (Service 1999, p. 28404).

Flowering occurs from mid-January to early March and fruits are fully developed by late spring or early summer (Gankin and Major 1964, p. 796). Ione manzanita is an obligate seeder that can be killed by fire and depends entirely on seeds stored in the soil or dispersed to the site for stand regeneration (Gankin and Major 1964, p. 795).

Ione manzanita is rare even within its range, and threats have reduced the size of populations, including mining, road construction, development and disease.

Population Status

Ione manzanita is rare. It is restricted to the Ione Formation in Amador and Calaveras counties, along an approximate 31.4-km (19.5-mile) stretch, with the main population occurring in western Amador County around the City of Ione. Ione manzanita occurs in a patchy distribution throughout all its presumed historical range in Amador County.

Recovery Plan Information

While a Recovery Plan for Ione manzanita has not been published, the Service has initiated work on a draft Recovery Plan for this species. Recommended actions for this species were provided in the 5-year review, including: (1) identify the current extent of the pathogen *Phytophthora cambivora* within the range of Ione manzanita (2) implement measures to restrict the movement of infested soil and plant materials from areas affected by *Phytophthora cinnamomi* (3) conduct research into how to eliminate *P. cinnamomi* from the ecosystem and identify other methods to prevent disease transmission (4) study the symptomatology, etiology, and impact of *P. cambivora* on Ione manzanita and other species (Service 2010).

Literature Cited

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Kern Mallow

Listing Status

The Service listed the Kern mallow as endangered on July 19, 1990 (Service, 1990). The Service has not designated critical habitat for this species.

Life History and Habitat

The Kern mallow is an arid-land annual plant. It is found on alkali flats and eroded hillsides, as well as in grassland and saltbush scrub habitats of the southern San Joaquin Valley and adjacent areas of California. The plant has straight stems that grow between 2.5 centimeters (one inch) to nearly 50 centimeters (20 inches) in length. The stems are covered with small hairs. Kern mallow has white to purple flowers that have five petals.

The Kern mallow responds to variation in precipitation experienced by California's climate by germinating and growing profusely the first wet year following a drought, and then declining in subsequent years as more robust native and non-native species crowd them out, until the next drought/wet cycle. Seeds typically germinate in January and February, and plants begin blooming in March. Fruit production begins within a few days after flowers appear; flower and fruit production may continue into May if sufficient moisture is available. The seeds fall from the fruits as soon as they are mature. Seeds are capable of germinating in the following growing season, but at least some remain ungerminated. Studies show that Kern mallow is pollinated by insects, but wind may also pollinate the flowers.

Threats to the species include habitat loss and fragmentation due to agricultural and urban development; oil, gas, and other mining exploration; competition with nonnative grasses; and climate change.

Population Status

Kern mallow population size can vary greatly depending on rainfall- a lack of Kern mallow at a location one year can be followed by hundreds of individuals the next. Historically, Kern mallow was thought to have a very restricted range. At the time of listing, the species was known from only six locations in an approximately 40 square mile area in western Kern County. In 2013, there were 212 occurrences spread throughout Kern, San Luis Obispo and Ventura counties. The number of extant Kern mallow occurrences has increased significantly since listing, primarily because the Service now considers more than one morphology to be Kern mallow, and increased survey efforts and verification of herbarium specimens have found new occurrences or reconfirmed old occurrences (Service, 2013; Service, 2020).

Recovery Plan Information

The Kern mallow's recovery strategy is described in the Recovery Plan for Upland Species of the San Joaquin Valley, California (Service 1998). The downlisting and delisting criteria for the Kern mallow include the following (Service, 1998; Service, 2020):

Downlisting

1. Secure and protect specified recovery areas from incompatible uses:
    a. 95% of occupied habitat on public lands;
    b. 75% of population and 75% of occupied habitat in Lokern.
2. Management Plan approved and implemented for recovery areas in the Lokern Area that include survival of the species as an objective.
3. Population monitoring in specified recovery areas shows stable or increasing populations through a precipitation cycle.

Delisting

1. Secure and protect specified recovery areas from incompatible uses:
    a. 90% or more each of population and occupied habitat in Lokern;

    b. Two or more distinct populations outside the Lokern Natural Area.
2. Management Plan approved and implemented for all protected areas identified as important to continued survival.
3. Population monitoring in specified recovery areas shows no decline after downlisting. If declining, determine cause and reverse trend.

Literature Cited

[Service] U.S. Fish and Wildlife Service. 1990. Endangered and Threatened Wildlife and Plants; determination of Endangered or Threatened Status for Five Plant from the Southern San Joaquin Valley. Final Rule. Federal Register 55: 29361-29370.

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[Service] U.S. Fish and Wildlife Service. 2013. *Eremalche kernensis* (Kern mallow) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Sacramento, California. August 2013. Available online at: https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/2052.pdf

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La Graciosa Thistle Critical Habitat

Critical Habitat

The Service designated critical habitat for La Graciosa thistle on March 17, 2004 (Service 2004, entire) and published a revised critical habitat designation on November 3, 2009 (Service 2009, entire). A total of 24,103 acres (as 6 units) were designated as critical habitat for the La Graciosa thistle in 2 California counties (San Luis Obispo and Santa Barbara). A detailed discussion of the methods used in designating critical habitat can be found in the final rule. All of the areas of critical habitat for the La Graciosa thistle are within the species' historical geographic range and contain PCEs to support at least one of the species' essential life history functions. Based on the current knowledge of the life history, biology, and ecology of the La Graciosa thistle, the Service determined that the PCEs of La Graciosa thistle critical habitat consist of:

1. Mesic areas associated with margins of dune swales, dune lakes, marshes, and estuaries that are associated with dynamic (changing) dune systems including the Santa Maria Valley Dune Complex and Santa Ynez Valley Dune Complex, and margins of dynamic riparian systems including the Santa Maria and Santa Ynez Rivers and Orcutt/Solomon and San Antonio Creeks, and freshwater seeps;
2. Associated plant communities that include Central dune scrub, coastal dune, coastal scrub, freshwater seep, coastal and valley freshwater marsh and fen, riparian scrub (e.g., mule fat scrub, willow scrub), oak woodland, intermittent streams, and other wetland communities;
3. Soils with a sandy component including but not limited to dune sands; and
4. Features that allow dispersal and connectivity between populations.

The balance of the species' critical habitat has been, and continues to be, disturbed by off-road vehicle activity, recreation, oil exploration, livestock grazing, agriculture, and installation and maintenance of roads and other transportation corridors.

Literature Cited

[Service] U.S. Fish and Wildlife Service. 2004. Endangered and Threatened Wildlife and Plants; Final Designation of Critical Habitat for *Cirsium loncholepis* (La Graciosa thistle). Federal Register 69: 12553-12569.

[Service] U.S. Fish and Wildlife Service. 2009. Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for *Cirsium loncholepis* (La Graciosa Thistle). Federal Register 74: 56978-57046

Layne’s Butterweed

Listing Status

Layne’s butterweed was listed as threatened on October 18, 1996 (Service 1996, p. 54346).

Life History and Habitat

Layne’s butterweed is an early successional perennial herb of the aster family with orange-yellow flowers that sprouts from a rootstock. Leaves are mostly basal lance-shaped and are 3 to 10 inches long. Each flower head has 5 to 8 orange-yellow petal-like ray flowers and numerous yellow disk flowers. The flower heads are 2 to 3 inches wide (Service 1996, p. 54348).

Layne’s butterweed grows in open rocky and disturbed areas within chaparral plant communities, primarily on gabbro soil formations and occasionally on serpentine soils (Service 1996, p. 54348). At Traverse Creek on the Eldorado National Forest, Layne’s butterweed occurs on serpentine soil within chaparral associated with buckbrush, blue oak and foothill pine (CNDDB 1998). In other parts of the National Forest, Layne’s butterweed is also associated with California bay.

The primary threat to Layne’s butterweed is the encroachment of native vegetation due to succession, even on lands in conservation ownership, in the absence of the natural fire regime. The long fire return interval due to fire suppression is preventing the formation of necessary clearings for Layne’s butterweed establishment and possibly the scarification of seeds needed for their germination (Service 2019). Other threats include invasive plants and development and habitat fragmentation. Invasive species including yellow starthistle (*Centaurea solstitalis*) and distaff thistle (*Carthamus lanatus*) have threatened a population within BLM’s Red Hills Kanaka Point Property in Tuolumne County (B. Brenneman, *in litt*. 2018*b*). Threats from fire suppression activities, off road vehicle use, and mining activities affect Layne’s butterweed on Tahoe and Eldorado National Forests (Service 2019).

Population Status

Layne’s butterweed is found at Pine Hill Preserve and in five general areas: two locations near Brownsville in Yuba County; Sugarpine Reservoir and Michigan Bluff on Tahoe National Forest in Placer County; Little Bald Mountain and along Traverse Creek near Georgetown on El Dorado National Forest in El Dorado County; scattered private lands in El Dorado County outside the Pine Hill Preserve; and roughly six locations near Don Pedro Reservoir in Tuolumne County (Service 2019). The Layne’s butterweed populations in Yuba and Placer counties and two of the six Tuolumne County populations have been newly discovered since listing (Service 2019).

Recovery Plan Information

On August 30, 2002, the Service issued the Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills, which includes Layne’s butterweed.

The delisting criteria for the Layne’s butterweed include the following (Service 2002):

Delisting will be considered if all of the following conditions have been met:

- Protection of specified recovery areas from incompatible uses:
    - Populations representing the range of the species including:
        - Cameron Park preserve, south of Highway 50
        - Cameron Park preserve, north of Highway 50
        - Pine Hill preserve
        - Penny Lane preserve
        - Salmon Falls/Martel Creek preserve
        - Occupied habitat on BLM lands in Yuba and Tuolumne Counties

        - Occupied habitat on the Eldorado National Forest; along with adjacent unoccupied habitat and a 150-meter (500-foot) buffer
- A management plan that includes the survival and recovery of Layne's butterweed as an objective has been approved and implemented for all populations and any occupied or unoccupied habitat identified as necessary for the survival and recovery of the species.
- Monitoring in all recommended preserves shows:
    - Populations are stable or increasing with evidence of natural recruitment for a period of 60 years that includes normal disturbance.
    - Habitat monitoring of recommended preserves shows a mosaic of multiage class stands and habitat fragmentation has not appreciably increased (less than 5 percent) within any preserves over current (2000) conditions.
    - Spatially and temporally, the establishment of occurrences must be at 10 perfect greater than the extirpation of the occurrences.
- Ameliorate or eliminate threats.
- Study importance of fire for management.
- Seeds of disjunct populations stored in at least two Center for Plant Conservation certified facilities.
- Maintain metapopulation dynamics of at least 1 very large, 1 large, 7 medium, and 24 small occurrences throughout the Pine Hill formation; of at least 1 large, 2 medium and 5 small in western El Dorado County; of at least 2 medium and 4 small in Tuolumne County; and of at least 2 small in Yuba County.

Literature Cited

[CNDDB] California Natural Diversity Data Base. 1998. A database application for the California Department of Fish and Game Natural Heritage Division.

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In Litteris

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Loch Lomond Coyote Thistle

Listing Status

Loch Lomond coyote thistle was listed as endangered on December 23, 1986 (51 FR 45904). No critical habitat has been designated.

Life History and Habitat

Loch Lomond coyote thistle is a plant that is dependent on vernal pools. It has slender, loosely branched stems that reach 20 to 30 centimeters (7.9 to 11.8 inches) tall. The entire plant is covered with downy hairs. The mature leaves are 11 to 16 centimeters (4.3 to 6.3 inches) long, and the leaf blade is lance shaped. In this species, the rounded flower heads are only 3 to 5 millimeters (0.12 to 0.20 inch) in diameter; however, the stems supporting the flower heads may be as much as 8 centimeters (3.1 inches) long. Each flower head contains only five to seven tiny flowers that can be white or tinged with purple.

The plant flowers after the water evaporates from the pools, typically between June and August (USFWS 2005). Little else is known about the reproductive ecology or demography of this species. However, its life history may be quite similar to that of *E. vaseyi* (Vasey's coyote-thistle): producing a tuft of tubular leaves underwater from the perennial rootstock or from a newly germinated seed in the late winter or early spring; developing broad terrestrial leaves later in the spring as the water evaporates; flowering in the summer; and developing fruits in July or August (USFWS 2005).

Threats to the species include changes in hydrology that impact vernal pools, routine highway maintenance, trash dumping, occasional fence vandalism, vehicle trespass and trampling (USFWS 2023).

Population Status

Loch Lomond coyote thistle is found in Lake and Sonoma counties in California (USFWS 2023). At the time of listing, the species was known from one population with an unknown number of plants at a vernal lake called Loch Lomond in Lake County, California (51 FR 45904). Since that time, additional occurrences have been located at Dry Lake and Cobb in Lake County and Diamond Mountain in Sonoma County (USFWS 2023).

Recovery Plan Information

On December 15, 2005, the Service issued the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon, which includes Loch Lomond coyote thistle (USFWS 2005).

Recovery Actions

Recovery criteria for this species include the following:

1. Habitat protection: Accomplish habitat protection that promotes vernal pool ecosystem function sufficient to contribute to population viability of the covered species.

    1A. Suitable vernal pool habitat within each prioritized core area for the species is protected.

    1B. Species occurrences distributed across the species geographic range and genetic range are protected. Protection of extreme edges of populations protects the genetic differences that occur there.

    1C. Reintroductions must be carried out and meet success criteria established in the recovery plan.

1D. Additional occurrences identified through future site assessments, GIS and other analyses, and status surveys that are determined essential to recovery are protected. Any newly found occurrences may count towards recovery goals if the occurrences are permanently protected as described in the recovery plan.

1E. Habitat protection results in protection of hydrology essential to vernal pool ecosystem function, and monitoring indicates that hydrology that contributes to population viability has been maintained through at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

2. Adaptive Habitat Management and Monitoring:

2A. Habitat management and monitoring plans that facilitate maintenance of vernal pool ecosystem function and population viability have been developed and implemented for all habitat protected, as previously discussed in Sections 1 (A-E).

2B. Mechanisms are in place to provide for management in perpetuity and long-term monitoring of habitat protected in Sections 1 (A-E), as previously discussed (funding, personnel, etc.).

2C. Monitoring indicates that ecosystem function has been maintained in the areas protected under Sections 1 (A-D) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

2D. Seed banking actions have been completed for species that would require it as insurance against risk of stochastic extirpations or that will require reintroductions or introductions to contribute to meeting recovery criteria.

3. Status Surveys:

3A. Status surveys, 5-year status reviews, and population monitoring show populations within each vernal pool region where the species occur are viable (e.g., evidence of reproduction and recruitment) and have been maintained (stable or increasing) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

3B. Status surveys, status reviews, and habitat monitoring show that threats identified during and since the listing process have been ameliorated or eliminated. Site-specific threats identified through standardized site assessments and habitat management planning also must be ameliorated or eliminated.

4. Research:

4A. Research actions necessary for recovery and conservation of the covered species have been identified (these are research actions that have not been specifically identified in the recovery actions but for which a process to develop them has been identified). Research actions (both specifically identified in the recovery actions and determined through the process) on species biology and ecology, habitat management and restoration, and methods to eliminate or ameliorate threats have been completed and incorporated into habitat protection, habitat management and monitoring, and species monitoring plans, and refinement of recovery criteria and actions.

4B. Research on genetic structure has been completed (for species where necessary – for reintroduction and introduction, seed banking) and results incorporated into habitat protection plans to ensure that within and among population genetic variation is fully representative by populations protected in the Habitat Protection section of this document, described previously in Sections 1 (A-E).

4C. Research necessary to determine appropriate parameters to measure population viability for each species have been completed.

5. Participation and outreach:

   5A. Recovery Implementation Team is established and functioning to oversee rangewide recovery efforts.

   5B. Vernal pool regional working groups are established and functioning to oversee regional recovery efforts.

   5C. Participation plans for each vernal pool region have been completed and implemented.

   5D. Vernal pool region working groups have developed and implemented outreach and incentive programs that develop partnerships contributing to achieving recovery criteria 1-4.

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Many-flowered Navarretia

Listing Status

Many-flowered navarretia was listed as endangered on June 18, 1997 (62 FR 33029). No critical habitat has been designated for the many-flowered navarretia.

Life History and Habitat

Many-flowered navarretia is an annual herb of the phlox family with pale blue flowers. Many-flowered navarretia forms mats 2.0 to 7.9 inches across and 0.4 to 1.2 inches high. The stems have a peeling, white surface and are highly branched. Stem thickness is 0.03 to 0.06 inch and is more or less uniform throughout its length. The leaves are 1.2 to 1.6 inches long and are either entire or have a few thread-like lobes. Flower heads are 0.6 to 0.8 inch across and contain between 10 and 60 pale blue flowers. Each flower in the head is 0.20 to 0.24 inches long. Each fruit may contain as many as three seeds. The fruit of this species is a papery capsule that breaks open only when wet (USFWS 2009).

Many-flowered navarretia is found in pools that form on volcanic substrate, specifically in Northern Basalt Flow and Northern Volcanic Ashflow Vernal Pools. Typical many-flowered navarretia is found only at Boggs Lake. The lake itself is classified as a northern volcanic ashflow vernal pool which consists of a clay layer that is impervious to water and is buried under a layer of volcanic ash. The soil at Boggs Lake is in the Collayomi-Aiken-Whispering complex. Elsewhere, Many-flowered navarretia occurs in vernal pools, vernal lakes and swales (USFWS 2005)

Little is known about the life history and demography of Many-flowered navarretia. Like many vernal pool annuals, its seeds germinate underwater and flower after the pools dry. The plants flower in May and June. The flowers are probably insect-pollinated. Navarretias with similar flowers that occur outside of vernal pools are pollinated by a variety of bees and bee flies, although other insects may visit to collect nectar (USFWS 2005).

The primary threats to this subspecies include wetland drainage, off-highway vehicle use, effects from road maintenance activities, residential development, competition from invasive weedy plant species, climate change, small population size, and risk of localized stochastic extirpations (USFWS 2009).

Population Status

Many-flowered navarretia is extremely rare. This subspecies is found only on substrates of volcanic origin and is dependent on vernal pools, vernal lakes, and swales for survival. Its life history is closely linked to the hydrology of these wetlands. As of 2009, there were seven known occurrences of this subspecies; five in Lake County and two in Sonoma County, which are potentially extirpated (USFWS 2009).

Recovery Plan Information

On December 15, 2005, the Service issued the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the many-flowered navarretia on page II-49 (USFWS 2005). General recovery criteria for the many-flowered navarretia and 19 other listed plants and animals are described in the Recovery Plan. This Recovery Plan uses an ecosystem-level approach because many of the listed species and species of concern addressed in the Recovery Plan co-occur in the same natural ecosystem and share the same threats. The five key elements that comprise this ecosystem-level recovery and conservation strategy are: 1) habitat protection; 2) adaptive habitat management and monitoring; 3) status surveys; 4) research; and 5) public participation and outreach.

Recovery criteria for this species include the following:

1. Habitat protection: Accomplish habitat protection that promotes vernal pool ecosystem function sufficient to contribute to population viability of the covered species.

    1A. Suitable vernal pool habitat within each prioritized core area for the species is protected.

    1B. Species occurrences distributed across the species geographic range and genetic range are protected. Protection of extreme edges of populations protects the genetic differences that occur there.

    1C. Reintroductions must be carried out and meet success criteria established in the recovery plan.

    1D. Additional occurrences identified through future site assessments, GIS and other analyses, and status surveys that are determined essential to recovery are protected. Any newly found occurrences may count towards recovery goals if the occurrences are permanently protected as described in the recovery plan.

    1E. Habitat protection results in protection of hydrology essential to vernal pool ecosystem function, and monitoring indicates that hydrology that contributes to population viability has been maintained through at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

2. Adaptive Habitat Management and Monitoring:

    2A. Habitat management and monitoring plans that facilitate maintenance of vernal pool ecosystem function and population viability have been developed and implemented for all habitat protected, as previously discussed in Sections 1 (A-E).

    2B. Mechanisms are in place to provide for management in perpetuity and long-term monitoring of habitat protected in Sections 1 (A-E), as previously discussed (funding, personnel, etc.).

    2C. Monitoring indicates that ecosystem function has been maintained in the areas protected under Sections 1 (A-D) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

    2D. Seed banking actions have been completed for species that would require it as insurance against risk of stochastic extirpations or that will require reintroductions or introductions to contribute to meeting recovery criteria.

3. Status Surveys:

    3A. Status surveys, 5-year status reviews, and population monitoring show populations within each vernal pool region where the species occur are viable (e.g., evidence of reproduction and recruitment) and have been maintained (stable or increasing) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

3B. Status surveys, status reviews, and habitat monitoring show that threats identified during and since the listing process have been ameliorated or eliminated. Site-specific threats identified through standardized site assessments and habitat management planning also must be ameliorated or eliminated.

4. Research:

   4A. Research actions necessary for recovery and conservation of the covered species have been identified (these are research actions that have not been specifically identified in the recovery actions but for which a process to develop them has been identified). Research actions (both specifically identified in the recovery actions and determined through the process) on species biology and ecology, habitat management and restoration, and methods to eliminate or ameliorate threats have been completed and incorporated into habitat protection, habitat management and monitoring, and species monitoring plans, and refinement of recovery criteria and actions.

   4B. Research on genetic structure has been completed (for species where necessary – for reintroduction and introduction, seed banking) and results incorporated into habitat protection plans to ensure that within and among population genetic variation is fully representative by populations protected in the Habitat Protection section of this document, described previously in Sections 1 (A-E).

   4C. Research necessary to determine appropriate parameters to measure population viability for each species have been completed.

5. Participation and outreach:

   5A. Recovery Implementation Team is established and functioning to oversee rangewide recovery efforts.

   5B. Vernal pool regional working groups are established and functioning to oversee regional recovery efforts.

   5C. Participation plans for each vernal pool region have been completed and implemented.

   5D. Vernal pool region working groups have developed and implemented outreach and incentive programs that develop partnerships contributing to achieving recovery criteria 1-4.

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Menzies' Wallflower

Listing Status

Menzies' wallflower (*Erysimum menziesii*) was listed as endangered on June 22, 1992 (50 FR 27848-27859).

Life History and Habitat

Menzies' wallflower is a member of the mustard family (Brassicaceae) endemic to coastal dune systems in California. Its life history is that of a monocarpic perennial, meaning that it flowers and produces fruit only once during its life, after which it dies. The wallflower forms a basal rosette of leaves that may persist for up to eight years before flowering. Blooming typically occurs from March through April, although it may begin as early as late February. The species is self-compatible; therefore, the reproduction of this species involves selfing and facultative outcrossing (able to produce seed either by self-pollination, or pollination by other plants). The fruits mature by mid-June. However, seeds remain attached to the fruit walls after dehiscence and disperse over a long period, primarily in conjunction with winter storm events that dislodge the mature inflorescences and scatter them by way of a wind-driven tumbling action (Pickart and Sawyer 1998). Germination follows the first rains in fall or early winter. Fecundity is high, with individual plants producing numerous seeds; however, the wallflower does not have a persistent seed bank in the soil (Carothers 1996), and seedling survivorship is low, with 98.3 percent mortality shown to occur in the first year (Pickart and Sawyer 1998). Reproduction may also be hindered by infestation of Albugo canadensis, an endemic fungal pathogen that causes white rust disease, at least in some of the populations in the Humboldt Bay area. Disease symptoms are more prevalent on reproductive individuals where they can decrease fecundity by reducing seed number or viability (Pickart and Sawyer 1998).

Menzies' wallflower occurs among the low growing perennial plants in the *Abronia latifolia – Ambrosia chamissonis* herbaceous alliance (dune mat) and *Leymus mollis* herbaceous alliance (sea lyme grass patches) (Sawyer 2009). Dune mat is composed of herbaceous low-growing vegetation adapted to the low nutrient soils and drought-like conditions of the dunes. It includes perennials such as (but not limited to): yellow sand verbena (*Abronia latifolia*), beach bur (*Ambrosia chamissonis*), beach bluegrass (*Poa macrantha*), coast buckwheat (*Eriogonum latifolium*), beach pea (*Lathyrus littoralis*), dune goldenrod (*Solidago spathulata*), and coastal sagewort (*Artemisia pycnocephala*) (Sawyer 2009). Sea lyme grass (now treated as *Elymus mollis* in the Jepson Manual, Baldwin 2012) is dominant or characteristically present in sea lyme grass patches and co-dominants include the same plants present in the dune mat community listed above (Sawyer 2009). Typically, the total vegetation cover in both communities is relatively sparse.

Population Status

Menzies' wallflower occurs in coastal dunes systems in Humboldt, Mendocino and Monterey counties in California. Below is a summary of the populations as described in the most recent 5-year review (Service 2020).

North Spit Humboldt Bay:

There is a large and healthy population of Menzies' wallflower on the North Spit of Humboldt Bay and much research and monitoring has occurred on this population. The Humboldt Bay National Wildlife Refuge produced a report in October 2018 on the population dynamics of Menzies' wallflower over three decades on the North Spit of Humboldt Bay (Pickart et al, 2018). Surveys were conducted every nine years from 1988 to 2015. The survey area was divided into nine areas representing geographically separate subpopulations or those under separate management jurisdictions (this includes private and public parcels). The subpopulations were mapped and sampled for density, reproductive status and disease incidence. The population-wide total has increased from approximately 20,000 to more than 133,000 individuals. However, there was substantial intrapopulation variability, with the Lanphere Dunes subpopulation exhibiting a much higher rate of increase than all other subpopulations, representing 64% of the total population but only 30% of the occupied habitat. The Lanphere Dunes area is owned and managed by the Humboldt Bay National Wildlife Refuge and includes areas that have seen decades of restoration. In general, densities have declined over time across the North Spit with some variation between sites, with the only exception being the Lanphere Dunes. The proportion of reproductive plants (number of plants in flower in relation to the total number of plants) in the population has varied by time interval, remaining between 0.4 and 0.5 for the first two intervals, then dropping to 0.3 in 2006 and jumping to 0.6 in 2015. Incidence of symptoms negatively affecting plants caused by white rust (Albugo candidans) increased significantly from 1997 to 2006. The lowest incidence was in 1997 with only 6% of plants symptomatic. That increased to 74% in 2006 and dropped only slightly to 71% in 2015. The proportion of available habitat increased at all sites except for the Lanphere Dunes subpopulation which is consistent with the increase in the density of plants within occupied habitat at Lanphere Dunes compared with other sites (Pickart et al, 2018). Overall, the North Spit Humboldt Bay population is stable and is exhibiting signs of increasing in particular areas. Invasive species, disease, and to a minor degree off-road vehicle use, are still threats.

South Spit Humboldt Bay:

There is a small population of Menzies' wallflower on the South Spit of Humboldt Bay. The 2008 5-year review reported a population size of 457 plants in 2006 with a proportion of 0.33 reproductive plants in relation to the total number of plants (Service 2008). This was the peak population size since it was discovered in 1991. Caging of reproductive plants to prevent herbivory from deer and rabbits occurred regularly until 2009 at which point caging and monitoring lapsed until 2017. In 2017 only 38 plants were counted (0.19 reproductive). The population increased to 76 plants in 2018 (0.32 reproductive). The count in 2020 resulted in 55 plants (0.24 reproductive). This population has historically been small and is threatened by herbivory and lack of available habitat. Both native species such as salt rush (*Juncus brewerii*) and non-native invasive species, including European beachgrass (*Ammophila arenaria*) yellow bush lupine (*Lupinus arboreus*) and Spanish lotus (*Acmispon americanus* var. *americanus*) occur in high densities in the location of the small Menzies' wallflower population on the South Spit of Humboldt Bay. These species compete with Menzies' wallflower and ultimately reduce optimal conditions for the endangered species to thrive.

Elk River Spit Humboldt Bay:

A census was conducted at the Elk River spit of Humboldt Bay in 2000 and 3,782 individuals were counted with a proportion of 0.13 reproductive plants (Pickart, 2000). In 2019 the census was repeated and 1,785 individuals were recorded (0.26 reproductive) (Service 2020). It's likely that the decline in population size is due to increased competition with invasive species, namely European beachgrass. This property is owned and managed by the City of Eureka. No active management has occurred to date at this location. Monitoring efforts have been conducted by the Service with permission from the City. This population is declining and threats include competition with invasive species and recreation.

MacKerricher State Park:

The Menzies' wallflower population located in Mendocino County largely occurs on lands owned and managed by the California State Parks. A mapping effort conducted in 2005 estimated 240 acres of occupied area. This effort was repeated in 2011 and resulted in an estimate of 273 acres of occupied habitat. A dune rehabilitation project was initiated in 2014 to remove 2.7 miles of remnant road and treat

55 acres of European beachgrass within the foredune and creek habitat types. The road, which impeded the natural processes of the dune system, was removed in 2014. That project initially had a negative impact on the Menzies' wallflower population and both compensatory and enhancement mitigation plots were established. Monitoring data provided by the State Parks show that Menzies' wallflower in both compensatory and enhancement plots have increased substantially in density. The compensation plots started with a baseline of 551 plants in 2013-2014 and increased to 5,542 plants in 2020. The enhancement plots had a baseline of 68 plants in 2013-2014 and increased to 1,053 plants in 2020. Restoration efforts are ongoing and this population has been expanding as invasive species are removed. Threats to this population include competition with invasive species and recreation.

Monterey Peninsula:

Survey information among the Monterey populations of Menzies' wallflower is patchy and the most recent information stems from ongoing or recently concluded restoration projects. As a result, population trends are difficult to discern. The available data provides a snapshot of where the species still persists and where future monitoring and management may be necessary to begin to meet recovery criteria. The summary data provided in the following four paragraphs is of populations where the Service has gained new information and is not exhaustive of all populations along the Monterey Peninsula. Populations on the Monterey Peninsula in general are stable to declining and are threatened by development, invasive species and recreation.

Marina Dunes

The Marina Dunes population includes historical occurrences at the Marina State Beach, Marina Dunes Preserve (Monterey Regional Parks District), Cemex-Lapis (RMC Pacific Cement Company), Salinas River National Wildlife Refuge, Fort Ord Dunes State Park, and Martin Dunes (Big Sur Land Trust). The Big Sur Land Trust has been conducting restoration and rare plant surveys at Martin Dunes in areas that have historically been occupied by Menzies' wallflower. Surveys in 2020 found no individuals of Menzies' wallflower at historical locations or in areas of active or planned restoration (CNDDB 2020, data; Wandke 2020, pers. com.). There is no annual monitoring of Menzies' wallflower at the Marina Dunes population. However, it was used as a reference to check for the blooming period of Menzies' wallflower for the Martin Dunes survey. During the reference site visit the Menzies' wallflower population was identified and confirmed to still be present (Wandke 2020, pers. com.). Surveys for Monterey Gilia (*Gilia tenuiflora* ssp. *arenaria*) were conducted at the Cemex-Lapis site and had overlap with historical occurrences of Menzies' wallflower. No Menzies' wallflower were identified during these surveys although not all areas could be surveyed due to overlap with locations of nesting western snowy plover (*Charadrius alexandrinus nivosus*) (Watson 2020, pers. com., Anderson 2020, pers. com.). The Cemex-Lapis sand mining operation is scheduled to halt by the end of 2020. The California Coastal Commission is requiring the company to restore the property following the closure.

*Point Pinos Lighthous*e

A 10-year dune restoration project concluded in 2015 at the Point Pinos Lighthouse Reservation (Wandke 2020, pers. com.). At the conclusion of the project in 2015, there were 868 Menzies' wallflower that had been propagated and planted from seed collected on site (Wandke 2020, pers. com.).

Pebble Beach Area

The Pebble Beach Area includes multiple locations that have historically supported Menzies' wallflower. Long term monitoring of these populations has not been established at this locaiton. The presence of

Menzies’ wallflower was confirmed at the Indian Village Dunes in 2019, however the species was not found at the Signal Hill dunes during the same time period (Lemein 2019, pers. com.).

Asilomar State Beach

Asilomar State Beach conducted a dune restoration and rare plant propagation and monitoring project in 2012 that lasted five years, concluding in 2017 (Gray 2018). As part of this project, seeds of Menzies’ wallflower were collected from onsite locations and propagated in an onsite greenhouse and then planted. Several thousand seed were collected, and several hundred plants were grown and outplanted. The last available count data for Menzies’ wallflower found 2,206 individuals in dune habitat throughout the property (Gray 2016, p. 4). With the project’s conclusion, no long term monitoring has been planned or funded.

Recovery Plan Information

The Seven Coastal Plants and the Myrtle’s Silverspot Butterfly Recovery Plan was issued on September 29, 1998. According to the recovery plan, Menzies’ wallflower can be considered for delisting when (1) the dunes systems it inhabits are protected from recreational violations, development, invasive weeds, and predators and (2) Each occupied dune system has reasonable numbers of plants distributed widely enough to minimize the risk from accidental or catastrophic events. The plan suggests that in the Humboldt Bay dunes systems there should be at least three populations with 300 or more individuals and two populations with 5,000 or more individuals. The other demographic recovery criteria reference subspecies that are not currently recognized by the Jepson Manual (Baldwin 2012) but can be interpreted as having similar goals for the dune systems in Mendocino and Monterey counties.

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Monterey Spineflower and its Critical Habitat

Listing Status

The Service listed the Monterey spineflower (*Chorizanthe pungens* var. *pungens*) as threatened on February 4, 1994 (Service 1994, entire). In 2008, the Service revised the critical habitat designation on 11,055 acres in Santa Cruz and Monterey Counties (Service 2008, entire). Monterey spineflower is included in the Recovery Plan for Seven Coastal Plants and the Myrtle's Silverspot Butterfly (Service 1998). On October 1, 2019, the Service amended the delisting criteria for Monterey spineflower in the recovery plan (Service 2019, entire).

Life History and Habitat

Monterey spineflower is an annual species in the buckwheat family (Polygonaceae) (Reveal et al. 2022, entire). The species is a low growing herb with long branching stems (5 to 15 centimeters) that support a dense cluster (inflorescence) of small (2 to 3.5 millimeters wide) white to pink flowers (Reveal and Hardham 1989, p. 124; Reveal et al. 2022, entire). The inflorescence, stems, and leaves are hairy, and the stems and leaves are slightly succulent. Robust spineflower (*Chorizanthe robusta* var. *robusta*) and diffuse spineflower (*C. diffusa*) may co-occur with Monterey spineflower; however, both can be differentiated from the Monterey spineflower through differences of the involucre margins and perianth lobes. Monterey spineflower responds strongly to annual precipitation patterns and temperatures, resulting in large fluctuations in the population of plants visible above ground from year to year. Monterey spineflower can be locally abundant under ideal conditions with individual plants scattered in openings among perennial vegetation.

At the time of listing, Monterey spineflower in the Monterey Bay area was known from scattered populations along the immediate coast, in the Prunedale Hills at Manzanita Park, in the coastal and inland areas of former Fort Ord Army Base, and from historical collections described as east of Watsonville and near Mission Soledad in the Salinas Valley. Since its listing, additional populations of Monterey spineflower have been discovered in the Prunedale Hills of Monterey County and interior areas of Santa Cruz County.

<u>Vegetation Structure</u>

Monterey spineflower primarily grows in openings of coastal dune, dune scrub, and chaparral in sandy soils where competition with other species is low (Reveal 2001, unpaginated). The species also occurs in other habitat types where low competition in sandy openings exist. Monterey spineflower is associated with the following soil series: coastal beaches, dune land, Baywood sand, Ben Lomond sandy loam, Elder sandy loam, Oceano loamy sand, Arnold loamy sand, Santa Ynez fine sandy loam, Arnold-Santa Ynez complex, Metz complex, and Metz loamy sand. A study of the closely related Ben Lomond spineflower (*Chorizanthe pungens* var. *hartwegiana*), found that shade was a more significant limiting factor than soil series, suggesting that Monterey spineflower may be similarly limited by competition and shade rather than soil (McGraw and Levin 1998, p. 124).

Monterey spineflower habitat is characterized by periodic disturbances that create the open space needed for the species' establishment. In coastal dune habitat, erosion, wind, and ocean-based transport of sand results in periodic rearrangements of dune morphology that reduce the amount of competing vegetation, facilitating presence of Monterey spineflower (Barbour and Johnson 1988, pp. 242-246). At inland sites in chaparral habitat, analogous openings in vegetation may be created by wildlife, fire, recreation, and development or maintenance of existing infrastructure. The abundance and distribution of Monterey spineflower colonies shift depending on seasonal conditions and changes in the amount of nearby vegetation cover.

Reproduction and Seed Ecology

Monterey spineflower can be found above ground as early as December (Fox et al. 2006, pp. 158-159) and flowers between April to July (Fox et al. 2006, p. 159; Reveal et al. 2022, entire). Each flower produces one seed and a single plant may produce dozens to over 100 flowers (Fox et al. 2006, p. 162). Dispersal of the seeds occur in mid-summer through the wind or though hooked spines on the structure that houses the seed and attaches to passing animals (Reveal 2001, unpaginated; McGraw 2004, p. 65). Seeds typically germinate after the onset of autumn or winter rains. Abundance of seedlings is likely dependent on the prior years' seed set, and survivorship has been positively correlated with spring rainfall. Seeds that do not germinate persist in soil until favorable conditions return (Fox et al. 2006, pp. 158-162).

Studies of the pollination ecology of the Monterey spineflower have not been conducted; however, studies of closely-related *Chorizanthe* taxa are considered relevant to conservation of the Monterey spineflower (Service 2009, p. 6). A pollination ecology study of the robust spineflower, which occurs in proximity to the Monterey spineflower at several locations in Santa Cruz County, found that while robust spineflower may self-pollinate, pollinator access to flowers significantly increased seed set (Murphy 2003, p. 40). Sweat bees (Halictidae), bumblebees (*Bombus* spp.), wasps (Sphecidae), European honeybees (*Apis mellifera*), and soft-winged flower beetles (Dasytidae) were observed to transport pollen of robust spineflower. Observations of the Ben Lomond spineflower noted floral visits by small ants, small flies, bee flies, European honeybees, and bumble bees (McGraw 2004, p. 69). Other unpublished reports further support the idea that insect pollinators increase Monterey spineflower reproduction and seed viability (Harding Lawson Associates 2000, p. 4; Service 2002, p. 37498).

Population Status

Rangewide Status of the Species

At the time of listing, the Monterey spineflower was known to occur in sand dunes along the coast between Manresa State Beach and the Monterey Peninsula, Manzanita Park in the Prunedale Hills, throughout the former Fort Ord Army Base (Fort Ord), and historical collections from Soledad and San Simeon (Service 1994, pp. 5499-5500). The population size was estimated to be approximately 2 million individuals across 7 occurrences (Service 1998, p. iii).

Since listing in 1994, new Monterey spineflower colonies have been observed and some existing colonies have been extirpated. In 2008, the California Natural Diversity Database (CNDDB) listed 51 occurrences of Monterey spineflower in coastal areas from southern Santa Cruz County to the Monterey Peninsula in Monterey County (CNDDB 2008). However, aerial imagery suggests that 19 occurrences have experienced habitat loss, and 9 occurrences have been developed or converted to agriculture. Therefore, only 23 occurrences likely remain (Service 2020, p. 6). Additionally, historical colonies south of the Monterey Peninsula have not been observed since listing and probably have been extirpated from the Salinas Valley, primarily due to conversion of the original grasslands and valley oak woodlands to agricultural crops (Reveal and Hardham 1989, p. 125).

Population data on each of the occurrences is sparse and continuous data is only available for Naval Support Activity (NSA) Monterey and portions of the former Fort Ord. The data provided by NSA Monterey suggest an annually fluctuating population that can vary from less than 100 individuals to 10,000 individuals (NSA 2019, p. 5). The largest occurrence of Monterey spineflower occurs at the former Fort Ord, where the annual population is consistently greater than 10,000 (Burleson 2018, unpublished data). However, this large population size is primarily due to the large acreage of available habitat on the former Fort Ord.

Updates in Phylogenetic Relationships

Researchers recently investigated the phylogenetic relationships of various members of the genus *Chorizanthe*, subsection *Pungentes*, including Monterey spineflower (Brinegar 2006, p. 13; Baron and Brinegar 2007, p. 5; Brinegar and Baron 2009, pp. 178-180). Using ribosomal DNA internal transcribed spacer sequencing, the study found that Monterey spineflower and robust spineflower were more closely related to one another than to the other subspecific taxa in the *C. pungens* and *C. robusta* complex (Brinegar 2006, p. 13). This suggests greater similarity between the predominantly coastal populations of Monterey spineflower and robust spineflower than the varieties of either species that occur in the Santa Cruz mountains (Brinegar and Baron 2009, p. 179). In contrast, using chloroplast DNA haplotypes, the same study found groups that more closely resembled the current taxonomic relationships. The chloroplast DNA haplotype results did not resolve a genetic difference between Ben Lomond spineflower and Scotts Valley spineflower, but instead grouped them together. In contrast, the robust spineflower and Monterey spineflower did resolve into separate northern and southern groups, respectively. Brinegar and Baron (2009, p. 179) concluded that it is likely that the species of *Chorizanthe* examined have recently diverged thus giving rise to the lack of strong genetic differentiation. While the researchers suggest that a taxonomic revision of the *Pungentes* complex may be in order, no changes are being proposed at this time (Brinegar and Baron 2009, p. 181).

Threats

The primary threats to the Monterey spineflower identified at the time of listing were habitat destruction due to residential and golf course development, agricultural land conversion, sand mining, military activities, encroachment by non-native plant species, recreation, and dune stabilization projects (Service 1994, pp. 5504-5507). These threats were again recognized in the recovery plan with emphasis placed on the threat of iceplant (*Carpobrotus* spp.) invasion and dune stabilization (Service 1998, p. 22). The 2009 5-year review recognized development, agricultural land conversion, invasive species and habitat succession, sand mining, and recreation to be the main threats to the Monterey spineflower (Service 2009, pp. 8-11). The 2020 5-year review states that development, and invasive species and habitat succession are the greatest threats to Monterey spineflower. Agricultural land conversion and recreation are now minor threats, and sand mining is no longer a threat to the species (Service 2020, p. 9-11).

One of the primary threats to the species is the direct loss of and reduction of Monterey spineflower habitat and individuals as a result of the disposal of lands and remediation activities associated with the 1997 Fort Ord Base Reuse Plan (reuse plan; EDAW Inc. and EMC Planning Group Inc. 1996, p. 4.172). Continued urban expansion, associated development of infrastructure within lands, and other permanent closure and reuse activities will result in the eventual loss of approximately 3,781 acres of Monterey spineflower habitat and 1,320 acres to Monterey spineflower critical habitat. Remediation activities, once completed, will result in temporary impacts to a total of 2,231 acres of Monterey spineflower habitat and 3,966 acres of Monterey spineflower critical habitat (Service 2017, pp. 8, 39-54). Although the reuse plan required that all recipients of former Fort Ord lands preserve, enhance, and restore habitat and populations of HMP species, including the Monterey spineflower, several recipients have not implemented, developed, or submitted proof of habitat management or monitoring (EDAW Inc. and EMC Planning Group Inc. 1996, pp. 4.172-4.174; EMC Planning Group Inc. 2012a, pp. 4.34-4-36, 4.79-4.80, 4.98, 4.100-4-108, 4.125-4.126; EMC Planning Group Inc. 2012b, pp. 1.19-1.23, 3.35-3.40, 3.48, 3.55-58, 3.63).

While recreation from hiking, biking, equestrian, or other activities may create open space that can provide habitat for Monterey spineflower, sustained use of open areas is not likely to support the species because of direct damage to plants through trampling, erosion along trail systems, and introduction of invasive species that compete with Monterey spineflower. Invasive species colonize open areas within coastal dune and chaparral habitat for Monterey spineflower, outcompete Monterey spineflower for light and water, and inhibit the natural processes that create open spaces where Monterey spineflower grows. The removal of invasive non-native species allows Monterey spineflower to recolonize sites formerly dominated by non-native species and increases the bare ground required for nesting by insects in the family Hymenoptera, which pollinate closely-related *Chorizanthe* taxa (Murphy 2003, p. 103; Service 2009, p. 10).

In areas where there are active weed control programs (e.g., Zmudowski State Beach, Salinas River State Beach, Fort Ord State Park), active management of invasive species has decreased the threat and increased the naturally recruiting native vegetation (A. Palkovic, California State Parks, pers. comm. 2020), but funding to maintain invasive species management is not guaranteed. The threat is more severe in areas where there is not adequate management of invasive species, resulting in the decline of open habitat for the Monterey spineflower.

Multiple studies have documented a correlation of the presence of the highly invasive non-native Argentine ant (*Linepithema humile*) with the displacement of native ants, lowered native insect diversity, and decreased rates of bee visitation (Suarez et al. 1998, pp. 2050-2053; Menke and Holway 2006, p. 374; Ward 1987, pp. 10-15; Human and Gordon 1996, pp. 407-411; Holway and Suarez 2006, pp. 321-323; Hanna et al. 2015, pp. 225-228; Bolger et al. 2000, p. 1243; LeVan et al. 2014, p. 167; DiGirolamo and Fox 2006, pp. 130-131). Given the role native ants and bees play in the reproductive biology of related *Chorizanthe* taxa (Murphy 2003, pp. 57-62, pp. 99-110; McGraw 2004, p. 69), the potential for Argentine ants to adversely affect Monterey spineflower pollination ecology merits further study.

Critical Habitat

Critical habitat for Monterey spineflower was designated in 2002 across 18,829 acres (ac) (7,620 hectares) in Santa Cruz and Monterey counties (Service 2002, 67 FR 37498). The designation was challenged in 2005. Final revised critical habitat was designated in 2008 (Service 2008, 73 FR 1525), which resulted in a decrease of 7,774 acres (3,146 hectares) to a total of 11,055 acres (4,475 hectares) throughout Santa Cruz and Monterey counties. The change in designated acreage was due to a revision of the primary constituent elements, reduction of included land under private ownership that had been developed, and removal of areas with soil types not known to support Monterey spineflower (Service 2008, 73 FR 1529). The 2008 final designation describes the primary constituent elements for Monterey spineflower as “a vegetation structure arranged in a mosaic with openings between the dominant elements (e.g., scrub, shrub, oak trees, or clumps of herbaceous vegetation) that changes in spatial position as a result of physical processes such as windblown sands and fire and that allows sunlight to reach the surface of the following sandy soils: coastal beaches, dune land, Baywood sand, Ben Lomond sandy loam, Elder sandy loam, Oceano loamy sand, Arnold loamy sand, Santa Ynez fine sandy loam, Arnold-Santa Ynez complex, Metz complex, and Metz loamy sand” (73 FR 1532).

Recovery Plan Information

Recovery Objectives/Delisting Criteria

The Monterey spineflower is included in the Recovery Plan for Seven Coastal Plants and the Myrtle’s Silverspot Butterfly (Service 1998, entire). Recovery objectives in the plan focus on conserving and managing the dune systems occupied by Monterey spineflower, controlling and managing exotic plants and other threats (e.g., recreational use and off-road vehicles), securing the species in their currently occupied ranges, and increasing the amount of occupied habitat through restoration and reintroduction efforts. The Service updated delisting criteria for Monterey spineflower in order to provide consistent and specific terminology for the delisting criteria (Service 2019, entire). Monterey spineflower can be considered for delisting when the following criteria have been met:

1. The Fort Ord disposal and reuse process has led management agencies to develop, fund, and implement permanent protection plans for the species' habitat (roughly 60 percent of Fort Ord) including permanent iceplant suppression programs;
2. Beach-dune occurrences on State Park and private lands throughout its current range from Santa Cruz to the Monterey Peninsula are covered under a permanent protection plan; and
3. Populations in the protected areas are stable or increasing over a 15-year period, which will include wet and drought years.

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<u>Personal Communications</u>

Palkovic, A. 2020. Email from Amy Palkovic, California State Parks, to Todd Lemein, U.S. Fish and Wildlife Service, regarding restoration work on California State Beaches in MontereyCounty.

Nipomo Mesa Lupine

Listing Status

The Service listed Nipomo Mesa lupine (*Lupinus nipomensis*) as endangered on March 20, 2000 (Service 2000, entire). We completed a 5-year review for the species in June 2019 (Service 2019, entire). All of the information included in this account is derived from the 2019 5-year review, unless otherwise noted. We finalized the Nipomo Mesa lupine Recovery Plan in December 2021 (Service 2021, entire). The State of California listed Nipomo Mesa lupine as endangered under the California Endangered Species Act in 1987 (CNDDB 2023, entire).

Life History and Habitat

Description

Nipomo Mesa lupine is a small, hairy annual herb in the Fabaceae (legume; pea and bean) family that reaches approximately 10 to 20 centimeters (4 to 8 inches) tall. The stems are decumbent (reclining close to the ground, but with the tips ascending) and the leaves are distinctively palmately compound, with five to seven leaflets that radiate out from a single point of origin, like fingers of a hand. The leaves are succulent and covered with downy, white hairs. Nipomo Mesa lupine inflorescences are dense and compact racemes (unbranched and arranged along a main, central axis called a rachis, where the bottom flowers mature and open first). The peduncle (stalk of the inflorescence) is also decumbent but bends abruptly upward at the base of the raceme. This characteristic appears as a right-angle bend just below the lowest flower and is considered diagnostic for the species. The flowers are bilaterally symmetric and composed of five purplish to pink petals. The upper petal is called the banner and it often has a white to yellow spot on the center, closer to the base. The two lower petals are called the wings, and these are partially fused. The wings enclose another set of fused petals called the keel that generally has glabrous (smooth, hairless) margins and this is another important characteristic used to differentiate Nipomo Mesa lupine from other closely related species. The flowers typically bloom March through May. Nipomo Mesa lupine fruits are legumes (like a conventional pea pod). They are green, and succulent and open along two vertical seams. The fruits are hairy, but may become glabrous with age. Each fruit typically produces 3 to 5 seeds, with as many as 30 fruits per inflorescence. A single individual can produce up to 900 fruits in a season, but most produce fewer.

Most plants typically start to form fruits between the months of April and June and do not stop fruiting until the plants die. The fruits are succulent, and this allows the seeds to continue to ripen even if they are broken off or if the plant is uprooted. Like other members of the Fabaceae, Nipomo Mesa lupine pods eventually dry out, which culminates in the explosion of the fruits as a dispersal mechanism. Fruits can disperse seed as far as 2 meters (6.6 feet). Since the plant is relatively decumbent, many of the fruits will hit the leaves of the parent plant and fall close to it on the ground.

Nipomo Mesa lupine likely has a persistent seed bank. Most lupine species (including this species) have a hard, orthodox seed that enables seed dormancy and a seed coat that is thick and impermeable below certain moisture thresholds. The seeds are generally able to remain dormant in the wild until softened by suitable moisture or other environmental conditions. To date, a single study evaluated the presence of Nipomo Mesa lupine seed within soil samples collected in a variety of sites throughout its range. Only two Nipomo lupine seeds were retrieved during the study and neither of them germinated.

Range

The species is restricted to a specific set of stabilized coastal sand dunes associated with the Nipomo Mesa landform in southwestern San Luis Obispo County, California. The dunes associated with the species occur within the Guadalupe-Nipomo Dunes complex. The entire extant range of Nipomo Mesa lupine is situated behind the more northern Callender dune sheet, which extends from the open sand along the coast to approximately the base of the Nipomo Mesa. The species is known from only a single population comprised of relatively few colonies and the number of individuals that appear in any given year is highly variable. The entire species range consists of approximately 5.2 square kilometers (2 square miles) that are located approximately 5 kilometers (3 miles) directly inland from the Pacific Ocean, and are situated along the backside of the Callender Dunes. Nipomo Mesa lupine occurs in the stabilized, vegetated areas behind the open sand and does not occur anyplace else throughout the Guadalupe-Nipomo Dunes complex.

Regional prevailing winds generally flow from the northwest to the southeast and the overall Nipomo Mesa lupine range follows this directional pattern. The species is restricted to the intergrade zone between the higher elevation Nipomo Mesa and the more open, Callender dune sheet. Black Lake Canyon bisects the Nipomo Mesa in a nearly horizontal line and the species range has likely always been restricted to the south side of this feature. Similarly, the extent of the Santa Maria Valley delineates the bottom edge of the Nipomo Mesa to the south. The Santa Maria Valley restricts the distribution of Nipomo Mesa lupine with its rich alluvium; thus, the species only occurs to the northwest of this feature. The open sands of the Callender Dune sheet also limit the extent of Nipomo Mesa lupine to the west, and similarly, the species does not occur within the higher elevations of the Nipomo Mesa, which limit its range to the east. There is no historical evidence that the species ever extended beyond these specific and narrow geographical limits.

Habitat

The stabilized back dunes where Nipomo Mesa lupine occurs are dominated by coastal dune scrub vegetation with the primary indicator species being mock heather (*Ericameria ericoides*). Presence of this species signals that enough stabilization has occurred to facilitate development of a later-successional plant community. This habitat type is extremely dynamic and diverse, and the species composition is highly variable depending on the amount of annual rainfall, level of disturbance, current land use and/or management regimes, successional stage of development, and degree of infestation from non-native invasive species, especially perennial veldt grass (*Ehrharta calycina*).

Coastal dune scrub vegetation with a relatively high diversity of native forbs appears to be the ideal habitat for Nipomo Mesa lupine. All of the known extant colonies occur in coastal dune scrub vegetation with at least some mock heather as the dominant shrub overstory. A few of the sites are relatively pristine and also support a diversity of annual forbs including, but not limited to sand verbena (*Abronia umbellata*), fiddleneck (*Amsinckia spectabilis*), dune baby blue eyes (*Phacelia douglasii*), miniature lupine (*L. bicolor*), cryptantha (*Cryptantha* spp.), purple owl's clover (*Castilleja exserta*), miniature sun cup (*Camissoniopis micrantha*), cardionema (*Cardionema ramosissimum*) and pygmy-weed (*Crassula connata*). Other non-native species often found in areas along with Nipomo Mesa lupine include filaree (*Erodium cicutarium*), brome grasses (*Bromus* spp.), perennial veldt grass, and false ice plant (*Conicosia pugioniformis*).

Natural History

The Nipomo Mesa is one of only four locations in the state that has an extremely rare, unique, and intact geologic formation called the pre-Flandrian terrace deposit. The deposit formed between approximately 11,700 and 2.6 million years ago and it is the oldest and most extensive area remaining. The four localities with this geology have higher elevations and are more interior dune formations emerging from beneath the outer, and geologically younger Flandrian dunes that are closer in proximity to the immediate coast. Nipomo Mesa lupine is a narrow endemic restricted to the interface zone between the outermost limits of the Flandrian, Callender dune sheet and the western slope of the pre-Flandrian Nipomo Mesa, and its distribution has an edaphic relationship to the substrate. The species requires patches of bare, open sand to persist. In the stabilized back dunes, these openings are created by natural aeolian (wind-driven erosion, transportation and deposition of sand) processes that serve to scour and disrupt established vegetation and other disturbance from small mammals, such as pocket gopher (*Thomomys bottae*). Disruption of the natural, dynamic ecological processes inherent to the functioning of coastal dune systems, particularly premature stabilization of dune sand movement from veldt grass invasion, may result in exclusion of Nipomo Mesa lupine, canopy closure, and persistence of later, more woody, successional plant communities.

All the soils associated with dune landforms are excessively well-drained, have a high rate of water transmission, and relatively low nutrient content. Since the water holding capacity of these sandy soils is low, soil moisture is lost quickly. Therefore, Nipomo Mesa lupine (and any other species growing on these landforms) is largely dependent on adequate rainfall to satisfy its hydric requirements. Nipomo Mesa lupine has an affinity for cooler temperatures and is often found near the bottom of north- and east-facing slopes and in the lower basins of shallow dune swales. Further studies showed the aspect was a more important abiotic variable than slope in influencing reproductive output in the species and temperature is likely another important factor for seed germination.

Population Status

Rangewide Status

We have always known the species from the single population identified at the time of listing (65 FR 14888) comprised of several colonies. We presently recognize three occurrences, which are specific locations where the species is or has been known to occur, within the population. By convention, we separate occurrences when there is at least 0.4-kilometer (0.25-mile) distance between documented locations. The first and largest occurrence is located on private land owned and operated by the Phillips 66 Oil Company. The Santa Maria Oil Refinery occurs on the 1,780-acre site and recently ceased operations in January of 2023. Phillips 66 proposes to demolish the refinery infrastructure and remediate the site (County of San Luis Obispo 2023, unpaginated). This is the only naturally occurring colony of the species. Portions of the site are grazed year-round, and others support grazing outside of the Nipomo Mesa lupine growing season. The western side (approximately 64 acres) of the property is managed by the Oceano Dunes State Vehicular Recreation Area (ODSVRA) for alternative access and emergency evacuation purposes. ODSVRA does coordinate with the Service on Nipomo Mesa lupine recovery and does implement some habitat management activities. Other small sections of the occurrence occur within the California Department of Transportation District 5 right of way and at the Callendar Substation that is owned by Pacific Gas and Electric.

The second occurrence is the product of relatively successful outplanting efforts, and a series of experiments conducted by the Land Conservancy of San Luis Obispo County (LC-SLO) and the Cheadle Center for Biodiversity and Ecological Restoration (CCBER), in collaboration with the Service. This outplanted colony is on a 160-acre site called the Black Lake Ecological Area (BLEA) that is owned and managed by LCSLO for conservation and to directly benefit local wildlife and rare, endemic plant species. The first seeding activities occurred in 2014 and the occurrence has been monitored continuously and re-seeded annually. It remains viable with consistent and ongoing coordination and management, especially with vigilant efforts by the LCSLO to suppress veldt grass. The seed used for the outplanting was collected on the south side of Jack Lake and in other areas behind the open dune sheet located between Black Lake Canyon and Jack Lake, on the west side of the Phillips 66 central infrastructure and development, in several accessions originally stored at the Santa Barbara Botanic Garden. Since then, CCBER bulked Nipomo Mesa lupine seed for the project and used it for subsequent outplantings.

The third occurrence is also an outplanting established in 2021 by LCSLO, CCBER, and the Service at the Kathleen's Canyon Overlook Park. This 160-acre site is owned and managed by LCSLO and is located just across State Highway1, east of BLEA. Nipomo Mesa lupine was vaguely mapped here historically, but likely became extirpated at the location. LCSLO continues to manage the site for Nipomo Mesa lupine recovery and CCBER continues to monitor and re-seed annually.

<u>*Threats*</u>

The current threats to Nipomo Mesa lupine include invasive species, development activities, seed predation, stochastic loss and extinction, and climate change.

Invasive Species

Invasive species are likely the most eminent threat to the species. Veldt grass invasion disrupts natural dune processes via stabilization, and changes the natural disturbance regime to which dune species are adapted. Veldt grass also contributes large amounts of biomass to the system, and suppresses germination of native annual species, including Nipomo Mesa lupine, due to competition for space, sunlight, water and nutrients; and accumulation of thatch. Veldt grass is a prolific seeder, forms a persistent seedbank, and readily colonizes any open space across the dune landscape. Nipomo Mesa lupine requires bare, sandy openings in a somewhat complex canopy structure within coastal dune scrub communities, where the woody species (like mock heather, silver dune lupine, and Blochman's ragwort [Senecio blochmaniae]) provide that structural heterogeneity. If allowed to persist, veldt grass can completely close the canopy and will dominate all of the open space within stands of coastal dune scrub vegetation, thereby reducing biodiversity by suppressing persistence of native, annual forbs.

Development

Colony extirpation, habitat loss, and other alterations resulting from development continue to threaten Nipomo Mesa lupine. Much of the extent of the historical species range, beyond where Nipomo lupine currently occurs, has been developed, and several previously known colonies were lost to development. Most of the Nipomo Mesa landform, and nearly all of the area on both the northern and southern sides of Black Lake Canyon, have been converted to rural- residential, industrial and agricultural land use. The overall conversion of habitat within the species historical range, resulting from changes in land use and the widespread regional development trajectory, are evidence of the continuing threats to the species. We do not yet know how implementation of the proposed Phillips 66 Santa Maria Refinery Demolition and Remediation Project will affect Nipomo Mesa lupine and its habitat, or the long-term future and plans for the site once this project has been completed.

Seed Predation

Nipomo lupine seeds are relatively large in size and like other members of the Fabaceae family, are likely to have a high nutrient value. Granivores generally prefer larger sized seeds with high nutrient/energy content (Bricker et al 2010, p. 91, Wang and Yang 2014, pp. 1, 4) and such seeds are more vulnerable to the effects of seed predation. Therefore, seed predation from small mammals (granivores), such as pocket gopher, kangaroo rat (Dipodomys spp.) and mice (Peromyscus spp.) is likely to adversely affect persistence of the Nipomo Mesa lupine seed bank and seedling recruitment. Adverse effects such as these have been seen with other members of the genus. Seed predation in dune habitats is more intense than in grasslands and rodent granivory on coastal bush lupine (L. arboreus) within dune systems drastically reduced both the seed bank and seedling recruitment (Maron and Simms 1997, pp. 81-82, Maron and Kauffman 2006, pp. 118, 120). Seed predation on silky lupine (L. sericeus) also lowered plant seedling recruitment and abundance in grassland systems, with denser cover (Bricker et al 2010, p. 91). Based on these studies, we believe that Nipomo Mesa lupine is likely vulnerable to granivory within both pristine stabilized dune habitats and in areas that are more heavily invaded by veldt grass.

Stochastic Loss and Extinction

Because Nipomo Mesa lupine is currently known from only a single population that extends over a relatively small geographic area, approximately 5.2 square kilometers (2 square miles), the species is vulnerable to stochastic (random or unpredictable) loss and extinction. Examples of stochastic events that could result in colony loss or extinction include fires, persistent droughts, flooding, novel pests and diseases, anomalous climate extremes, and windstorms.

Climate Change

According to California's Fourth Climate Assessment for the Central Coast Region, several climate change effects are likely to occur along the Central Coast by the end of the century. These include (but are not limited to): increased maximum and minimum temperatures, increase precipitation variability, accelerated sea level rise, increased exposure to flooding, increased period El Niño events, increased drought, higher frequency of wildfires and lengthened post-fire recovery times, narrowing of beaches, and water supply shortages. Any of these effects are likely to adversely impact Nipomo Mesa lupine because of its restricted range, limited distribution, annual life cycle, habitat requirements, and proximity to the coast. Nipomo Mesa lupine reproductive output and seed germination rates were negatively affected by experimental drought stress. Increased flooding or wildfire could also cause colony extirpation or loss of the entire species.

Recovery Plan Information

Recovery

The main objectives for Nipomo Mesa lupine recovery outlined in the species recovery plan are to systematically increase its' resiliency, redundancy, and representation to a viable and self-sustaining state, suitable for this narrow endemic. Recovery will be signified by a consistent increase in the population over time and establishment of new self-sustaining (or resilient) occurrences. Annual monitoring data should be implemented to demonstrate that resiliency has improved, as demonstrated by ample ecological representation across the range of available suitable habitat and sufficient redundancy to ensure survival in the face of catastrophic events (Service 2021, p. 5).

Downlisting Criteria

Nipomo Mesa lupine may be considered for downlisting when the following criteria are met:

1. At least three resilient occurrences display stable or increasing population trends averaged over 10 consecutive years;
2. Each of the three resilient occurrences is protected from habitat loss, including development activities;
3. Each of the three resilient occurrences is being managed in a way that will support the continued existence of Nipomo lupine and its coastal dune scrub habitat, including management of non-native, invasive species;

4. Management is effective as shown by monitoring for 10 consecutive years; and
5. An ex situ permanent conservation seedbank is established in a Center for Plant Conservation-affiliated botanic garden that reflects the breadth of the species' genetic diversity.

Having three resilient occurrences will increase the species redundancy back to what it likely was historically and increase its representation throughout its limited range. Ten years typically encompasses the full range of wet and dry year variation in coastal California.

Delisting Criteria

Once the downlisting criteria have been met, Nipomo Mesa lupine may be considered for delisting when the following criteria are met:

1. At least five resilient occurrences, are successfully established within the Guadalupe- Nipomo Dunes Complex, and display stable or increasing population trends averaged over 10 consecutive years;
2. Each of the five resilient occurrences is protected from habitat loss, including development activities;
3. Each of the five resilient occurrences is being managed in a way that will support continued existence of Nipomo lupine and its coastal dune scrub habitat, including management of non-native, invasive species; and
4. Management is effective as shown by monitoring for 10 consecutive years.

Having five resilient occurrences would further increase the species redundancy and representation, so that it is better equipped and more able to withstand catastrophic events and potential environmental changes, particularly in the face of climate change. Threats from climate change, including increased drought, flooding, and wildfire, are predicted to be persistent in ways that the species has not experienced in the past, warranting increased redundancy and representation to mitigate extinction risk (Service 2020, p. 14-15).

Recovery Actions

High-priority recovery actions for Nipomo Mesa lupine are also included in the species recovery plan. These are recovery actions that are the prioritized, site-specific interventions that need to be taken to conserve, manage, restore, and enhance the current condition of Nipomo Mesa lupine and its habitat to meet the recovery criteria. The recovery actions identified are based on the best available science and are those that the Service and other species experts deem imperative to move Nipomo Mesa lupine towards recovery.

Nearly all of the Nipomo Mesa lupine recovery actions need to be initiated immediately given the level of urgency associated with the species' high extinction risk. Some of the recovery actions are designed to help inform future management endeavors and therefore, may take longer to implement. Examples of these types of recovery actions include research-based elements that, when accomplished, will fill important knowledge gaps and inform subsequent restoration plans and recovery decisions. The recovery actions pertain to the three extant occurrences but will also apply to any new outplanting sites once they are established. The recovery actions for Nipomo Mesa lupine are provided below.

1. Protect all currently unprotected habitat where the species occurs. The coastal dune scrub habitat associated with Nipomo Mesa lupine has a limited distribution and is considered a sensitive vegetation type. We will work with potential partners to establish conservation easements, fee title agreements, or other appropriately protective measures on private lands that support the species and its habitat for conservation.
2. Conduct outplanting activities at suitable sites to establish new occurrences throughout the Guadalupe-Nipomo Dunes Region. Additional potential outplanting locations include Coreopsis Hill, the US Fish and Wildlife Service Guadalupe-Nipomo Dunes National Wildlife Refuge, Guadalupe Oil Field, Dune Lakes Unlimited, Oceano Dunes Natural Preserve, and Trilogy Dunes Open Space.
3. Manage habitat that supports the species to reduce or eliminate threats to the population (particularly non-native, invasive weeds) and to foster natural regeneration and recruitment of Nipomo Mesa lupine.
4. Collect seed and deposit accessions into the permanent conservation seedbank established for the species at the Santa Barbara Botanic Garden that includes additional backup sent to the U.S. Department of Agriculture’s National Laboratory for Genetic Resource Preservation seed vault, located in Fort Collins, Colorado.
5. Conduct annual census monitoring and experimental research projects across the occurrences to fill data gaps and document the progress of recovery implementation.
6. Determine those factors necessary for seed survival, optimal germination, and effective seedling establishment and use this information to ensure future recovery efforts. In particular, consider the role of disturbance, predation, and pollination on the species viability.
7. Conduct genetics and demographic research to better inform future recovery activities and criteria. Examples of potential projects include:
8. Investigate the effects of outplanting on the species genetic variability and compare variability of extant occurrences to that of propagated lines.
9. Determine the number of reproducing individuals required for population resiliency in any given occurrence.
10. Quantify seedbank longevity.
11. Develop opportunities for education and outreach within local and regional communities, and throughout San Luis Obispo County.

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Palmate-Bracted Bird’s-Beak

Listing Status

The Service listed the palmate-bracted bird's-beak as endangered on July 1, 1986 (Service, 1986). The Service has not designated critical habitat for this species.

Life History and Habitat

The palmate-bracted bird’s-beak is an annual flowering herb in the broomrape family (Orobanchaceae). It can be found in seasonally flooded lowland plains and basins of the Sacramento and San Joaquin Valleys.

Palmate-bracted bird's-beak plants are 4 to 12 inches tall and highly branched. The stems and leaves are grayish green and sometimes are covered with salt crystals excreted by glandular hairs. Pale whitish flowers, up to one inch long, are arranged in dense spikes tightly surrounded by leaf-like bracts. It blooms from late spring through summer. The most common visitors to its flowers are western bumble bee (*Bombus vosnesenskii*) and sweat bees (*family Lasioglossum*). It reproduces via seeds.

Like other members of this family, palmate-bracted bird’s-beak is partially parasitic, obtaining water and nutrients from the roots of other plants. The species grows on seasonally flooded, saline-alkali soils in lowland plains and basins at elevations of less than 500 feet in the Sacramento and San Joaquin Valleys.

Threats to the species include agricultural conversion, intensive livestock grazing, urbanization, and other activities that alter their habitat. Invasive non-native plants, loss of pollinators from use of pesticides, climate change, increased ozone, and dust are additional threats. Cattle grazing can be both beneficial and harmful depending on how this management tool is applied.

Population Status

The species’ population sizes can vary greatly depending on rainfall, salinity, and available host plants (Service, 2023). A small population size one year can be followed by a much larger one the following year when conditions are optimal. Historically, the palmate-bracted bird’s-beak was documented at nine sites between 1916 and 1982 (in Alameda, Colusa, Fresno, Madera, San Joaquin, and Yolo Counties), but only three were known to be extant at the time the species was listed in 1986: two natural populations (Springtown Alkali Sink and southeast of Woodland, which is now known as Alkali Grasslands Preserve) and one transplanted population (Mendota Wildlife Area). As of 2009, the species was known to occur as a mosaic of small, isolated patches on approximately 1,500 acres of occupied habitat at eight sites ranging from the northern Sacramento Valley south to the San Joaquin Valley. There have been few changes in the distribution of palmate-bracted bird’s-beak since the Service’s 2009 status review of the species, except that two of those eight occupied sites may now be extirpated (Service, 2023).

Recovery Plan Information

The palmate-bracted bird’s-beak recovery strategy is described in the Recovery Plan for Upland Species of the San Joaquin Valley, California (Service, 1998). The downlisting and delisting criteria for the palmate-bracted bird’s-beak include the following (Service, 1998):

Downlisting

1. Secure and protect specified recovery areas from incompatible uses:
    a. 95% of occupied habitat on public lands;
    b. 75% or more of population and occupied area and upland nesting habitat for pollinators within 300 meters (984 feet) of the population margins at Springtown Alkali Sink;
    c. Two or more populations in the San Joaquin Valley.
2. Management Plan approved and implemented for all protected areas identified as important to the species’ continued survival.

3. Population monitoring in specified recovery areas shows stable or increasing populations through a precipitation cycle.

Delisting

1. Secure and protect specified recovery areas from incompatible uses:
    a. Eight or more distinct populations, including two or more in the San Joaquin Valley;
    b. 90% or more of the Springtown Alkali Sink population and habitat.
2. Management Plan approved and implemented for all protected areas identified as important to the species' continued survival.
3. Population monitoring in specified recovery areas shows no decline after downlisting. If declining, determine cause and reverse trend.

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Parish's Daisy and its Critical Habitat

Listing Status

Parish's daisy is endemic to the northeastern San Bernardino Mountains and adjacent foothills near Lucerne Valley, southeast to the western Little San Bernardino Mountains. The Service listed the species as threatened on August 24, 1994 (67 FR 43652).

Life History and Habitat

Per Olson (2003), Parish's daisy is a small perennial herb of the aster family (Asteraceae) reaches 1 to 3 decimeters (4 to 12 inches) in height and blooms from May through June. The plant is typically associated with pinyon woodlands, pinyon-juniper woodlands, and blackbush scrub from 1,220 to 1,950 meters (4,000 to 6,400 feet) in elevation. It usually grows on dry, rocky slopes, shallow drainages, and outwash plains on substrates derived from limestone or dolomite. Some populations occur on a granite/limestone interface, usually a granitic parent material overlaid with limestone materials washed down from above (Olson 2003).

Population Status

According to the Carbonate Habitat Management Strategy (Olson 2003), 1,029 acres of occupied habitat exist for Parish's daisy in the action area. We described previous consultations that addressed existing ground disturbance within the Forest in the above general environmental baseline section and under the Cushenbury oxytheca baseline. The potential threats to the species are habitat loss by urban development, OHV activities, recreational activities, and mining activities.

At the time of listing, the Service documented fewer than 25 occurrences with a total population size of about 16,000 individuals. Less than a third of the occurrences had more than 1,000 individuals.

Approximately 2,320 acres of designated critical habitat exists within the boundaries of the action area. For additional information about the status of critical habitat on the Mountaintop Ranger District, please refer to the Service's 5-year review for this species (Service 2009h).

Critical Habitat

The Service designated 4,420 acres of critical habitat for the species on December 24, 2002 (67 FR 78570) on Federal and private lands. The physical and biological features of critical habitat for this species are: (1) soils derived primarily from upstream or upslope limestone, dolomite, or quartz monzonite parent materials that occur on dry, rocky hillsides, shallow drainages, or outwash plains at elevations between 3,842 and 6,400 feet; (2) soils with intact, natural surfaces that have not been substantially altered by land use activities (e.g., graded, excavated, re-contoured, or otherwise altered by ground-disturbing equipment); and (3) associated plant communities that have areas with an open canopy cover.

Recovery Plan Information

A final recovery plan has not yet been completed for this species. However, a draft Recovery Plan covering San Bernardino Mountains Carbonate Endemic Plants, which includes Cushenbury buckwheat was created September 1997 (Service 1997). For more information, please see the aforementioned document.

Literature Cited

Olson T.G. 2003. Carbonate Habitat Management Strategy. Prepared for San Bernardino National Forest Association.

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Pedate Checker-Mallow

Listing Status

The Service listed pedate checker-mallow as endangered on August 31, 1984 (49 FR 34500).

Life History and Habitat

Pedate checker-mallow is a perennial herb, restricted to the moist alkaline meadows in the Big Bear Valley on the San Bernardino Mountains (Service 2011). For more information on the species and its life history, please see our 2011 5-year review (Service 2011)

Population Status

At the time of listing, the Service documented 19 occurrences of the species on the Forest at three locations, which are on the south shore of Big Bear Lake, near Baldwin Lake, and near Bluff Lake. In addition, at the time of listing, data from the California Natural Diversity Database (CNDDB; CNDDB 2010) and the Recovery Plan for this species (Service 1998) indicated that there were 24 historical occurrences; since listing and the documentation of occurrences from CNDDB and the Recovery Plan, an additional occurrence has been located in the front yard of a Boulder Bay residence and believed to have been extant at the time of listing.

We reassessed our occurrence status determinations in our 2011 5-year review and updated the status of nine occurrences, based on monitoring data, the date since last survey, and information in the CNDDB (Service 2021). Finally, we have removed two element occurrences (EO; EOs 10 and 19) because they are now part of another EO. Based on those updates, there are 25 occurrences of pedate checker-mallow. Nine are extant, seven are presumed extant, one is possibly extirpated, and eight are extirpated (Service 2021)

Recovery Plan Information

Under the Recovery Plan for this species (Service 1998), the delisting criteria require protecting habitat and addressing threats that reduce populations for pedate checker-mallow. Thus, the recovery of these species depends on:

1. Protecting, enhancing, and conserving extant populations of *Sidalcea pedata* and *Thelypodium stenopetalum* and adjacent suitable habitat for each species.
2. Developing and effectively implementing a cooperative management plan (or plans) to guide and ensure the monitoring, maintenance, and conservation of all populations of these species.
3. Restoring or enhancing lands suitable for occupation by *Sidalcea pedata* and *Thelypodium stenopetalum* to provide sufficient, suitable habitat for both species.
4. Conducting research on the population dynamics, ecology and physiology of these species that will enable the a) adaptive management of existing populations and habitat, b) establishment of additional populations, and c) the restoration, enhancement, and development of supplementary habitat.
5. Educating the public through educational outreach programs designed to heighten public awareness of the need for the protection and recovery of these rare species as a step toward maintaining biodiversity.

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Pine Hill Ceanothus

Listing Status

Pine Hill ceanothus was listed as endangered on October 18, 1996 (Service 1996, p. 54346).

Life History and Habitat

Pine Hill ceanothus is a low-growing mat- to mound-like evergreen shrub with blue-tinged white flowers that grows in gabbro soils. It is a prostrate evergreen shrub of the buckthorn family that generally grows to 9.8 feet in diameter. The smooth gray-brown branches radiate from a central axis and root when they come into contact with the ground. Its leaves are semi-erect with smooth-edged margins. Small whitish flowers tinged with blue appear from March through June. Its fruit is a generally not horned, globe-shaped capsule (Service 1996, p. 54347).

Flower/fruit development in this species is negatively affected by canopy shading (James 1996). Unlike most chaparral shrub species, Pine Hill ceanothus will not resprout from a caudex (woody axis comprising the stem and root) after a fire, and therefore, depends on nearby plants connected via branch layering for survival or the seedbank for re-establishment (Boyd 2007). There is reason to believe that seeds can survive at least 80 years in the seedbank (Ayres 2011; Boyd 2007). Hot/cold stratification, but not necessarily fire, seems to be required for germination (James 1996; Boyd 2007). Because juvenile plants do not begin flowering until 5-6 years after fire, populations need a fire-free period of at least six years to replenish the seed bank (Marsh and Ayres 2002; Ayres 2011), otherwise populations may be permanently lost.

Pine Hill ceanothus occurs exclusively on gabbro soils in chaparral and woodland vegetation communities in the Central Sierra Nevada foothills in California (Service 2010).

Threats include alteration of the natural fire regime and encroachment of native plants due to succession. Alteration of the natural fire regime includes fires that occur too frequently, which kill recently germinated plants before they can contribute to the seedbank, and fires that do not occur frequently enough, which fail to provide for the creation of regeneration niches free of shading (Service 2010).

Population Status

At the time of listing, Pine Hill ceanothus occurred primarily on the Pine Hill formation in western El Dorado County, California, ranging in elevation from 453 to 2,060 feet (Service 1996, p. 54346). Today, the species is only found in the Pine Hill Preserve and the immediate vicinity (Service 2010).

Recovery Plan Information

On August 30, 2002, the Service issued the Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills, which includes Pine Hill ceanothus.

The downlisting and delisting criteria for the Pine Hill ceanothus include the following (Service 2002):

Downlisting:

- Protection of specified recovery areas from incompatible uses:
    - Cameron Park preserve, south of Highway 50
    - Cameron Park preserve, north of Highway 50
    - Pine Hill preserve; Salmon Falls/Martel Creek preserve
    - Sufficient adjacent unoccupied habitat for fire management and a 150-meter (500-foot) buffer

- A management plan that includes the survival and recovery of Pine Hill ceanothus as an objective has been approved and implemented for preserves and any occupied or unoccupied habitat identified as necessary for continued survival and recovery of the species.
- Monitoring in all recommended preserves shows:
    - Populations are stable or over increasing one fire cycle (about 30 years) (subject to modification depending on results of fire management studies).
    - Habitat monitoring of recommended preserves shows a mosaic of multiage class stands and habitat fragmentation has not appreciably increased (less than 5 percent) within any preserves over current (2000) conditions.
    - Spatially and temporally, the establishment of occurrences must be greater than the extirpation of the occurrences.
- Ameliorate or eliminate threats.
- Fire management studies.
- Research on propagation techniques if repatriation, enhancement, or restoration are determined to be necessary.
- Maintain metapopulation dynamics of at least 2 very large, 2 large, 6 medium, and 7 small occurrences throughout the range of the species.

Delisting will be considered when, in addition to the criteria for downlisting, all of the following conditions have been met:

- A management plan that includes the survival and recovery of Pine Hill ceanothus as an objective has been approved and implemented for all occurrences and any adjacent areas identified as necessary for continued survival and recovery of the species.
- Monitoring in all recommended preserves shows:
    - No population decline after downlisting during two additional fire cycles (about 60 years); if declining, determine cause and reverse trend
    - Habitat monitoring of recommended preserves shows a mosaic of multiage class stands and habitat fragmentation has not appreciably increased (less than 5 percent) within any preserves over current (2000) conditions.
    - Spatially and temporally, the establishment of occurrences must be at least 10 percent greater than the extirpation of occurrences.
- Ameliorate or eliminate threats.
- Research on propagation techniques if repatriation, enhancement, or restoration are determined to be necessary.

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Pismo Clarkia

Listing Status

The Service listed Pismo clarkia (*Clarkia speciosa* ssp. *immaculata*) as endangered on December 15, 1994 (Service 1994, entire). We included Pismo clarkia in the Recovery Plan for Morro Shoulderband Snail and Four Plants from Western San Luis Obispo County, California (Service 1998, entire). We completed 5-year reviews in 2009 and 2023 (Service 2009, entire; 2023, entire).

Life History and Habitat

Pismo clarkia is an annual herb in the evening-primrose family (Onagraceae). It grows less than 50 centimeters (20 inches) tall and has puberulent (finely hairy) stems and linear to narrowly lanceolate leaves. The flowers are radially symmetric and bowl-shaped, with four fan-shaped petals that fuse together at the base to form a funnel-like hypanthium. The showy flowers typically bloom May through July. Pismo clarkia has elongate capsule fruits that generally produce many small black seeds (Lewis 2012, website).

Pismo clarkia is one of four subspecies ([ssp.] *C. s.* ssp. *immaculata*; *C. s.* ssp. *nitens*; *C. s.* ssp. *polyantha*; and *C. s.* ssp. *speciosa*) currently recognized in the Jepson eFlora of California (Jepson Flora Project 2023, website; Lewis 2012, website). Of these, only Pismo clarkia and red spot clarkia (*C. s.* ssp. *speciosa*) occur in San Luis Obispo County, and this is the only county where Pismo clarkia occurs. These two taxa are differentiated by their ecology, distributions, and morphology, and exhibit internal barriers to gene exchange (Lewis 2012, website; Lewis and Lewis 1955, p. 289). Pismo clarkia is restricted to sandy coastal hillsides within San Luis Obispo County that are less than 100 meters or 328 feet above mean sea level, whereas red spot clarkia occurs in more inland woodland habitats, up to 500 meters in elevation. Red spot clarkias' range is not restricted to a single county and its distribution extends throughout the inner and outer South Coast Ranges, including Monterey, San Benito, San Luis Obispo, and Santa Barbara counties (Lewis 2012, website; Lewis and Lewis 1955, p. 290).

Pismo clarkia flowers are larger than red spot clarkias' and their stems are more decumbent (lying close to the ground with the ends curving upward), while red spot clarkia stems are decumbent to erect. Pismo clarkia flower petals typically do not have spots, and the flowers are hot pink (or magenta) to lavender in color and fade to white, or light cream toward the base. Red spot clarkia petals have a conspicuous (and distinctive) red spot, which is positioned at or near the middle of the petals, and the petals may or may not fade in color towards the base. Red spot clarkia floral coloration is variable, while Pismo clarkias' is consistent and constrained (Lewis 2012, website; Lewis and Lewis 1955, pp. 289–292).

The second edition of Vascular Plants of San Luis Obispo County, California includes a taxonomic treatment of *Clarkia* for this county (Keil and Hoover 2022, pp. 565–570). Here the author differentiates Pismo clarkia and red spot clarkia by petal color, and the presence and location of petal spots, if present on Pismo clarkia. It may rarely have a small, red proximal spot on the petals. Red spot clarkia petals have a distal red or purple spot on the petals (Keil and Hoover 2022, pp. 566, 569). We recommend Pismo clarkia be identified using this newly revised treatment.

<u>*Habitat*</u>

Like all North American clarkia species, Pismo clarkia is associated with open sites in oak woodland habitats (Lewis and Lewis 1955, p. 242). However, it is restricted to a relatively small geographic area composed of sandy, coastal hillsides near the City of Pismo Beach and inland to the community of Edna, in San Luis Obispo County (Lewis 2012, website). It also has an affinity for openings in other habitat types that occur within this region including grasslands, coastal scrub, and chaparral (Keil 2018, p. 63).

Pismo clarkia is often found within the transition zones between these different vegetation communities. For example, it often occurs within marginal areas and gradients between stands of oak woodland and the other habitat types. Coast live oak (*Quercus agrifolia*) is the dominant oak in woodlands that support the taxon. Chaparral communities associated with Pismo clarkia are typically dominated by Santa Margarita manzanita (*Arctostaphylos pilosula*), which is another endemic to this same geographic region. Coastal scrub areas where the taxon occurs often have California sagebrush (*Artemisia californica*), black sage (*Salvia mellifera*), California croton (*Croton californicus*), and sticky monkeyflower (*Diplacus aurantiacus*). Lastly, grasslands that support Pismo clarkia are mostly dominated by nonnatives including bromes (*Bromus* spp.), wild oat (*Avena* spp.), barley (*Hordeum* spp.), filaree (*Erodium* spp.), and the invasive perennial veldt grass (*Ehrharta calycina*), (California Native Plant Society [CNPS] 2023, website; California Natural Diversity Database [CNDDB] 2023, website).

<u>*Reproduction*</u>

The reproductive biology of Pismo clarkia is not well studied. All *C. speciosa* have relatively large, showy flowers with eight stamens arranged in two series of four and a stigma that is distinctively four-lobed. The mature style is longer than the stamens and situated above them. It reaches maturity after the stamens (called protandry), and this is believed to have evolved to encourage outcrossing and help ensure that self-fertilization does not occur. However, all species in the genus are self-compatible (Lewis and Lewis 1955, pp. 246, 249, 289). Selfing evolved independently from other outcrossing species within *Clarkia* at least 10 times but is likely not utilized for reproduction in *C. speciosa* because of its persistent protandrous floral morphology (Moeller and Geber 2005, p. 787). While selfing may occasionally occur in *C. speciosa*, most successful reproductive events occur via outcrossing with insect pollinators. Based on studies from other *Clarkia* species, potential pollinators of *C. speciosa* may include both specialist and generalist bees, flies, butterflies and moths, beetles, and hummingbirds (Lewis and Lewis 1955, p. 249; Moeller 2005, pp. 30–31; Miller et al 2014, pp. 320–321). However, evaluations of floral visitors and pollinators for taxa within *C. speciosa* have not occurred.

We do not know how long Pismo clarkia seeds remain viable. Seeds likely persist in the soil as a seedbank based on observations by researchers that Pismo clarkia plants did not appear in the same locations in consecutive years (Service 1998, p. 33). Other research showed that *C. williamsonii* seeds remained viable and ungerminated as a seed bank in any given year of monitoring (Price et al 1985, pp. 154–155). *Clarkia springvillensis* seeds stored at room temperature were not viable after eight years. However, they remained viable for at least 2 consecutive years of study (McCue and Holtsford 1998, p. 33). Therefore, we presume Pismo clarkia is similar to many other California native annual plants that produce seeds with multiyear dormancy and make large, and potentially long-lasting soil seed banks (LaForgia et al 2018, p. 896).

Population Status

Pismo clarkia is currently known from a total of 26 CNDDB occurrences, 70 herbarium specimens from Consortium of California Herbaria Data Portal 2 (CCH2), and 3 additional locations provided to us from other partners (CNDDB 2023, website; CCH2 2023, website; S. Bahm, California Department of Fish and Wildlife [CDFW], Central Region, pers. comm. 2023; B. Langle, SWCA, pers. comm. 2023). Of the 70 known CCH2 specimens, only 17 include location information suitable for georeferencing. All the CNDDB occurrences, 17 georeferenced CCH2 specimens, and the 3 "Other" known Pismo clarkia locations are located within southwestern San Luis Obispo County (Service 2023, p. 6). Keil describes the taxon's range as the sandy hills between San Luis Valley and Arroyo Grande, inland to the Huasna District (Keil and Hoover 2022, p. 569). Two of the 26 CNDDB occurrences are extirpated and 6 are considered likely extirpated. At least some portions of 4 Pismo clarkia CNDDB occurrences are known to be extant and the remaining 14 are presumed extant (CNDDB 2023, website; M. Willis, San Luis Obispo County Public Works Department, pers. comm. 2022). The three other locations are likely extant (Bahm pers. comm. 2023; Langle pers. comm. 2023).

We have limited available abundance data for Pismo clarkia. Only 17 of the 26 CNDDB occurrences have any reported abundance. Four of these have zero individuals reported and are therefore likely extirpated. Of the remaining 13 CNDDB occurrences with reported abundance, only 3 include observations made after 2009, which is when we completed the last Pismo clarkia 5-year review (Service 2009, entire; CNDDB 2023, website). Botanists reported 4,552 individuals at CNDDB occurrence number 14 in 2022 (Terra Verde Environmental Consulting 2022, p. 3). They observed approximately 770 Pismo clarkia individuals at occurrence number 20 in 2016 and 150 at occurrence number 28 in 2010 (CNDDB 2023, website). Botanists also reported approximately 150 Pismo clarkia individuals at Other data point number 1 in 2022 and 6,139 at Other data point number 2 in 2021 (Rincon Consultants, Inc. 2022, p. 28; SWCA Environmental Consultants 2022, p. 4.4-17; Service 2023, pp. 6–7). Currently, these data indicate that Other data point number 2 is the largest known Pismo clarkia population and CNDDB occurrence number 14 is the next largest (CNDDB 2023, website; Service 2023, pp. 6, 22–25).

Threats

The current threats to Pismo clarkia include direct loss of plants and seedbank, habitat loss, fragmentation, isolation, and other adverse alterations from development (such as urban, residential, and oil and gas); ongoing maintenance of existing roads and transportation infrastructure; adverse effects from nonnative, invasive weeds; overgrazing; stochastic extinction; and climate change effects (including sea level rise, Service 2022, pp. 11–15). More information about each of these threats is provided below.

Development

Pismo clarkia faces continued risk of removal, disturbance, fragmentation, increased isolation, and edge effects resulting from development activities (Service 2023, pp. 12–14). Ground disturbance from development increases introductions and proliferation of nonnative, invasive weeds, which further degrades and alters the taxon's habitat (With 2002, p. 1193; Schutte et al. 2012, pp. 1–2; California Invasive Plant Council 2012, p. 2; Poland et al. 2021, p. 10). One of the biggest challenges for Pismo clarkia recovery is that it occurs predominantly on private properties. Therefore, impacts often go unreported, and even if projects are subject to environmental laws and regulations during development and implementation, we typically have no access to the sites after any monitoring and reporting requirements are completed. Without ongoing management, these sites continue to decline and may become extirpated because of the synergistic threats associated with fragmentation, edge-effects, and increased introduction and spread of nonnative, invasive species. Conservation in the form of county-level easements or other deed restrictions has limited enforcement or tracking and therefore seems largely ineffective. Several proposed development projects illustrate the relative severity of this threat to existing Pismo clarkia including the 1,289-acre Dana Reserve Specific Plan residential development, 1,750-foot Southern California Gas Pipeline Realignment project, 156-acre Triple R Ranch Agriculture and Residential development (Service 2023, pp. 12–14). Degradation or loss of any occurrence negatively impacts the species because it is such a narrow endemic. Further isolation reduces connectivity between occurrences and their pollinators, which increases the likelihood of stochastic loss and local extirpation.

Ongoing Transportation and Infrastructure Maintenance

Adverse effects from road grading, roadside traffic, and other more general transportation and infrastructure (e.g., power lines and poles, gas and utilities pipelines, bridges, overpasses, crossings) maintenance activities (e.g., mowing, vegetation trimming and removal, fuels management, herbicide spraying) continue to pose threats to Pismo clarkia. Several known occurrences extend into roadsides, and transportation and other utilities right-of-ways (e.g., Pacific Gas and Electric power lines and poles). We've recently observed and received several notifications of mowing, vegetation trimming, spraying, ground-disturbance, and removal of Pismo clarkia from ongoing private, transportation, and other infrastructure maintenance activities (K. Nelson, California Native Plant Society, pers. comm. 2023; CDFW 2023).

Nonnative, Invasive Weeds

Nonnative, invasive weeds compete directly with native species for resources and degrade habitat quality (Poland et al. 2021, pp. 9–11). Buildup of thatch from nonnative, invasive weeds also inhibits and can arrest germination of natives and suppress their seedbanks (Levine et al. 2003, p. 775; Molinari and D'Antonio 2020, pp. 957, 966). Future development projects will likely increase the introduction and spread of nonnative, invasive plant species (California Invasive Plant Council 2012, p. 2). Further, ongoing operational and maintenance components of developments have potential to continue to adversely affect Pismo clarkia and its habitat via subsequent introductions and spread of nonnative, invasive weeds. In turn, shifts in the plant species community composition from natives to nonnative, invasives can adversely affect pollinators, lower biodiversity in general, and increase fire frequency (Poland et al. 2021, pp. 9–11). Nonnative, invasive species including ripgut brome (*Bromus diandrus*), veldt grass (*Ehrharta calycina*), filaree (*Erodium* spp.), and oat (*Avena* spp.) were noted in many occupied habitats (CNDDB 2023, website).

Overgrazing

Several Pismo clarkia occurrences are subject to cattle grazing (D. Kruse, GeoFusion Construction Company, pers. comm. 2023; CNDDB 2023, website). At appropriate thresholds and when timed correctly, grazing may provide some benefits to Pismo clarkia by controlling other potentially competing plant species, and reducing effects from nonnative, invasives and thatch. However, overgrazing can be detrimental to the taxon via trampling, soil compaction, increased erosion, vegetation removal, and alterations to hydrology. Such practices may also result in conversions to weedy, nonnative and invasive vegetation types (Stein 2016, pp. 2319, 2329; Abdelsalam 2021, p. 149). Overgrazing, and general grazing may also affect Pismo clarkia seed germination and growth, and impact floral, fruit, and seed development, depending on the timing of grazing (H. Rodriguez, CDFW, Central Region, pers. comm. 2023). Over extended periods of time, overgrazing may lead to extirpation of Pismo clarkia occurrences and continues to pose threats.

Stochastic Extinction

Stochastic (random) extirpation and extinction of Pismo clarkia is a threat because of its inherently limited range, small population sizes, and level of existing habitat fragmentation between occurrences. Annual species like Pismo clarkia experience wide fluctuations in population sizes from year to year that may reduce the overall viability of populations (Service 2009, p. 9; Menges 1991, pp. 161–162). Ecological variables like increased temperatures and prolonged drought may reduce Pismo clarkia annual abundance, lower seed production, and result in further depletion of existing seed banks (Levine et al. 2011, pp. 2245; Ooi 2012, pp. S53–S54). Effects from these factors likely increase threats from stochastic loss, making extirpation and extinction even more likely.

Climate Change Effects

Pismo clarkia will likely be affected by climate change including anticipated increases in maximum and minimum temperatures, slightly increased precipitation with substantially increased variability, increased locally extreme rainfall events, accelerated sea level rise, and increased drought (Langridge et al. 2018, p. 6). Average precipitation is predicted to increase by 1.1 to 3.8 inches, minimum average temperature by 4.7 to 7.6 degrees Fahrenheit, and maximum average temperature by 4.9 to 7.6 degrees Fahrenheit by 2099 throughout San Luis Obispo County (Langridge et al. 2018, pp. 13-17). Current climate models suggest that there will be fewer days of higher-than-average precipitation, leading to an increased number of dry days between precipitation events (Langridge et al. 2018, p. 16). Tolerance of Pismo clarkia to these climate changes is unknown. However, because the timing and effective completion of many stages of annual species life cycles (e.g., seed germination, growth, floral development) depend on ecological variables, (e.g., temperature, annual precipitation), we recognize climate change effects as a threat to the taxon.

Recovery Plan Information

Downlisting Criteria

We developed the following downlisting criteria in the recovery plan for Pismo clarkia (Service 1998, p. 43):

1. Eight populations are on lands secured from human-induced threats with adequate surrounding habitat to permit natural population expansion and movement as suitable microhabitats shift in the landscape.
2. The eight protected populations represent the plant's entire range.
3. These populations must be large, stable or increasing (a minimum of 10 years of monitoring is needed because population sizes fluctuate due to precipitation).
4. Management of these populations and associated lands in the future must be reasonably assured for the long-term, and must be effective, as demonstrated by stable or increasing populations.

Delisting Criteria

The 1998 recovery plan did not include delisting criteria because so little information was available on the taxon's' reproductive biology, soil seedbank dynamics, response to grazing, and population dynamics within suitable habitats. We still have not obtained enough new information on these subjects, but because Section 4(f)(1)(B)(ii) of the U.S. Endangered Species Act of 1973 (as amended, [Act]) requires that each recovery plan incorporate to the maximum extent practicable, "objective, measurable criteria which, when met, would result in a determination…that the species be removed from the list," in 2019 we amended the 1998 recovery plan to include delisting criteria for Pismo clarkia.

We developed the following delisting criteria in Amendment 1 to the recovery plan for Pismo clarkia (Service 2019, p. 7):

1. Threats are reduced or eliminated so that occurrences are capable of persisting without significant human intervention or perpetual endowments are secured for management necessary to maintain the continued existence of the taxon.
2. An ex-situ seedbank is established in a Center for Plant Conservation- affiliated botanic garden. While sufficient seedbank in the soil would typically provide a strategy for the taxon to persist through several years of short- or medium-term drought, it may not be sufficient to persist through long-term drought. Therefore, an ex-situ seedbank would provide assurance that occurrences could be reseeded, should long-term drought- or other stochastic events- make it necessary.

3. All existing occurrences are stable or increasing in the wild for at least 10 years. We expect above-ground occurrence size to fluctuate annually, based on response to amount and timing of rainfall. Therefore, a period of 10 years should be long enough to include most of the variability in rainfall that occurs in this region. Monitoring of occurrences should be undertaken and access to private properties that support the taxon should be pursued, which will provide a baseline for the status of the known occurrences; these data should provide a basis for monitoring occurrence attributes and trends to determine the taxon's trajectory over time.

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Sacramento Orcutt Grass and its Critical Habitat

Listing Status

The Sacramento Orcutt grass (*Orcuttia viscida*) was listed as endangered on March 26, 1997 (62 FR 14338). Critical habitat was designated for the Sacramento Orcutt grass on February 10, 2006 (71 FR 7118).

Life History and Habitat

Orcuttia viscida is known only from vernal pool habitats in a 22-square-mile area in Sacramento County, California. *O. viscida* requires a very well-developed soil with a silica-iron hardpan layer 2-10 feet below ground level. This impermeable hardpan causes water to perch above ground. Habitat creation for the genus *Orcuttia* is probably impossible because of its specific soil requirements (NatureServe 2015).

Other members of the genus are known to be wind pollinated and dispersed by water and by adhering to feet and fur with the sticky exudate. Given the similarity between congeners, it is likely *O. viscida* shares these characteristics (NatureServe 2015).

The genus *Orcuttia* forms a distinct group within the grass family with no apparent affinities to any other grasses, probably of ancient origin. Common associates include coyote thistle (*Eryngium* spp.), spike rush (*Eleocharis* spp.), Carter's buttercup (*Ramnunculus alveolatus*), double-horned downingia (*Downingia bicornata*), white-flowered navarretia (*Navarrettia leucocephala*), and annual checkerbloom (*Sidalcea calycosa*). *O. viscida* requires enough standing water to allow the growth of an anaerobic fungus over the seed coat to break dormancy. In drier years the seeds remain dormant. Seeds may remain viable for many years. *Orcuttia* seem to be poor competitors and only grow in areas where prolonged (but not constant) inundation drowns out competitors (NatureServe 2015).

Population Status

Rangewide Status of the Species

The Sacramento Orcutt grass is known only from Sacramento County, California in two main clumps. The two areas add up to approximately 22 square miles of range extent (NatureServe 2015).

Population Summary

The Sacramento Orcutt grass is highly vulnerable. Long term trend probably has been one of moderate to substantial decline, of approximately 30-70%. In a good year, there can be as many as greater than 2 million total plants. But plant numbers are not very informative here. The species is known from nine total occurrences, one of which is historical and extirpated (NatureServe 2015). Low redundancy, resiliency, and representation are inferred based on the low number of populations and restricted geography of this species.

The current population trend information (numbers of plants) for *Orcuttia viscida* indicates this species appears to be stable at five of the nine occurrences. No quantitative information is available for the other four locations. However, threats to *Orcuttia viscida* from loss of habitat, primarily from urbanization and land conversion to agriculture, continue at the single unprotected occurrence located east of Grant Line Road. Competition from nonnative, aggressive plant species, especially *Glyceria declinata* (waxy manna grass), threatens at least five occurrences of *Orcuttia viscida*. *Parentucellia viscosa* (sticky bartsia) has become established at Kiefer Landfill Wetland Preserve and likely threatens the *Orcuttia viscida* occurrences there (USFWS 2008).

California Natural Diversity Database reports the existence of nine extant occurrences of *Orcuttia viscida*, whereas the recovery plan reported eight occurrences. The location of the most recently recorded occurrence, at Arroyo Seco Conservation Bank, which was not included in the Recovery Plan, is within the known range of the species and is approximately 6.4 kilometers (4 miles) from another extant occurrence (USFWS 2008). Therefore, this additional occurrence does not substantially increase the amount of known occupied habitat and is not a range extension. Although the occurrences that have been monitored appear to be stable, many of the occurrences occupy small areas and have a small number of plants. For example, *Orcuttia viscida* at the Rancho Seco occurrence occupied two vernal pools in previous years but only 17 plants in a single pool could be found in 2005 (USFWS 2008).

<u>*Threats*</u>

Threats to this species include:

- Urbanization continues to be the greatest threat to the single, unprotected occurrence, located east of Grant Line Road (USFWS 2008).
- Proposed expansion of Kiefer Landfill is listed as a threat to this species (USFWS 2008).
- Proposed gravel and aggregate mining (62 FR 14338) is listed as a threat to this species (USFWS 2008).
- It is estimated that if the *Glyceria declinata* populations in *Orcuttia viscida* habitat grow at the rate of the San Joaquin or Phoenix Park populations, *O. viscida* could be completely displaced by *G. declinata* in 10 years or less. Voluntary efforts to remove *G. declinata* at Phoenix Park by hand-pulling have been the only efforts to control the species in *O. viscida* habitat. At Kiefer Landfill Wetland Preserve, sticky bartsia (*Parentucellia viscosa*) is invading the upper edges of the vernal pools that surround the vernal pools supporting *Orcuttia viscida*. The effects of this species on *Orcuttia viscida* are currently unknown; however, this species warrants observation (USFWS 2008).
- Habitat for *Orcuttia viscida* continues to be highly fragmented throughout its range due to conversion of natural habitat for urban and agricultural uses. This fragmentation has resulted in small, isolated populations of this species. For example, at least three occurrences are each found in single vernal pools. Such populations may be highly susceptible to extirpation due to chance events, inbreeding depression, or additional environmental disturbance. If an extirpation event occurs in a population that has been fragmented, the opportunities for recolonization will be greatly reduced due to physical isolation from other source populations (USFWS 2008).
- Climate change is a threat to this species (USFWS 2008).

<u>*Five-Year Status Review*</u>

On June 15, 2008, the USFWS issued a five-year status review of the Sacramento Orcutt grass, which resulted in no change in listing status (USFWS 2008).

Critical Habitat

Critical habitat was designated for the Sacramento Orcutt grass on February 10, 2006 (71 FR 7118). The critical habitat designation for *Orcuttia viscida* includes three units in Amador and Sacramento counties, California. This species critical habitat encompasses approximately 33,273 acres (ac) (13,465 hectares (ha)) (71 FR 7118).

- Unit 1: Sacramento County, California. From USGS 1:24,000 topographic quadrangle Folsom.
- Unit 2: Sacramento County, California. From USGS 1:24,000 topographic quadrangle Carmichael.

- Unit 3: Sacramento and Amador counties, California. From USGS 1:24,000 topographic quadrangles Sloughhouse, Carbondale, Clay, and Goose Creek.

Primary constituent elements (PCEs) are the physical and biological features of critical habitat essential to a species' conservation. The PCEs of critical habitat for Sacramento Orcutt grass (*Orcuttia viscida*) are the habitat components that provide (71 FR 7118):

(i) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools described in paragraph ((ii) of this section, providing for dispersal and promoting hydroperiods of adequate length in the pools; and
(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and nonnative upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the Sacramento Orcutt grass (USFWS 2005).

Recovery Actions

- Conduct a study to identify methods to control the dispersal of the invasive grass, *Glyceria declinata*, in vernal pool habitat (USFWS 2008).
- Develop and implement a management plan for control of nonnative, competitive plants, particularly *Glyceria declinata*. Phoenix Park, Phoenix Field, and Kiefer Landfill Wetland Preserve should be targeted for immediate control of *Glyceria declinata*. All remaining *Orcuttia viscida* occurrences should be surveyed for presence of *Glyceria declinata* and managed accordingly (USFWS 2008).
- Introduce appropriate levels of grazing at the Rancho Seco site to benefit the *Orcuttia viscida* occurrence (USFWS 2008).
- Work with SMUD to permanently protect the *Orcuttia viscida* plants and habitat, facilitate livestock watering improvements, and improve the cattle grazing regime to benefit *Orcuttia viscida* (USFWS 2008).
- Conduct genetic research on *Glyceria declinata* to clarify its taxonomy (USFWS 2008).

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San Bernardino Bluegrass

Listing Status

The Service listed San Bernardino bluegrass as endangered on September 14, 1998 (63 FR 49006).

Life History and Habitat

San Bernardino bluegrass is a perennial grass, located within montane meadows in the Big Bear Valley on the San Bernardino Mountains. As identified in the designation of critical habitat for this species, the physical and biological features of the species habitat include: (1) wet meadows subject to flooding during wet years in the San Bernardino Mountains in San Bernardino County at elevations of 6,700 to 8,100 feet, and in the Laguna and Palomar Mountains of San Diego County at elevations of 6,000 to 7,500 feet, that provide space for individual and population growth, reproduction, and dispersal; and (2) well-drained, loamy alluvial to sandy loam soils occurring in the wet meadow system, with a 0 to 16 percent slope, to provide water, air, minerals, and other nutritional or physiological requirements to the species. For more detailed information about the species description, legal/listing status, distribution and population trends, life history, habitat affinities, and the status of critical habitat, please refer to the mentioned Federal Register documents and the 5-year review for this species (Service 2008).

Population Status

There are currently 29 occurrences of San Bernardino bluegrass across the species' range. A total of 27 occurrences are considered extant or presumed extant, 1 is vague, and 1 is extirpated. Since the last 5-year review in 2008, 9 of the 27 occurrences have been observed (Service 2020)

Recovery Plan Information

While the Service has not developed a recovery plan for San Bernardino bluegrass, we did include recommendations in our 5-year review for actions that should be implemented over the next 5 years to assist in San Bernardino bluegrass recovery. These recommendations are to coordinate with the Forest Service to reduce impacts of recreational use of roads and trails in meadow habitat and develop monitoring plans to detect downward trends in populations for meadow plants (Service 2008).

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San Diego Ambrosia and its Critical Habitat

Listing Status

San Diego ambrosia was federally listed as endangered on July 2, 2002, due to present or threatened destruction, fragmentation, and degradation of habitat primarily by construction and maintenance of highways, maintenance of utility easements, development of recreational facilities, and residential and commercial development; inadequate regulatory mechanisms; potential competition, encroachment, and other negative impacts from non-native plants; mowing and discing for fuel modification; and trampling, as well as soil compaction by horses, humans, and vehicles (67 FR 44372). Critical habitat was designated on November 30, 2010 (75 FR 74546).

Life History and Habitat

San Diego ambrosia is a clonal herbaceous perennial plant occurring in southern California. It is historically known from western Riverside County, south through western San Diego County, to central Baja California, Mexico. The species is found primarily on upper terraces of rivers and drainages. However, several patches occur within the watershed of a large vernal pool at the Barry Jones (Skunk Hollow) Wetland Mitigation Bank in Riverside County and near dry lake beds in Baja California, Mexico (Service 2021).

Population Status

At listing, 15 native occurrences of San Diego ambrosia were considered extant in the United States: three in Riverside County and 12 in San Diego County. There are currently 37 occurrences in the United States that are presumed extant, including 11 from translocations. In addition, 31 occurrences are known from three geographic areas in northern Baja California, Mexico and two records from southern Baja California, Mexico (Service 2021).

The 2010 5-year review identified habitat fragmentation and climate change as additional threats to the species and that grazing was no longer a threat. Inadequate regulatory mechanism was previously considered a threat but is no longer considered to be a threat. At the 2010 5-year review, some degree of conservation was afforded to 11 of 16 occurrences (Service 2010). Of the 26 extant, natural occurrences of San Diego ambrosia in the United States documented in the 2021 5-year review, only 6 are completely conserved and 9 are partially conserved. The remaining 11 occurrences are not conserved and are more vulnerable to habitat loss from urban development. Protections afforded under the approved, regional habitat conservation plans have decreased but not eliminated major habitat loss and alteration. Overall, 41 percent (78.4 of 191.8 acres) of occupied habitat (natural, extant records) is considered conserved, typically with some degree of management including 15.1 of 54.4 acres in Riverside County and 63.4 of 137.4 acres in San Diego County (Service 2021). None of the San Diego ambrosia in Baja California, Mexico is conserved or provided regulatory protection.

Critical Habitat

Designated critical habitat occurs in seven units in Riverside and San Diego counties for a total of approximately 783 acres. The physical and biological features of designated critical habitat include:

1. Sandy loam or clay soils (regardless of disturbance status), including (but not limited to) the Placentia (sandy loam), Diablo (clay), and Ramona (sandy loam) soil series that occur near (up to several hundred meters from but not directly adjacent to) a river, creek, or other drainage, or within the watershed of a vernal pool, and that occur on an upper terrace (flat or gently sloping areas of 0 to 42 percent slopes are typical for terraces on which San Diego ambrosia occurrences are found).

2. Grassland or ruderal habitat types, or openings within coastal sage scrub, on the soil types and topography described in physical and biological feature 1, that provide adequate sunlight, and airflow for wind pollination.

Recovery Plan Information

No recovery plan has been written for this species.

Literature Cited

[Service] U.S. Fish and Wildlife Service. 2010. *Ambrosia pumila* (San Diego ambrosia) 5-year review: summary and evaluation. 39 pp.

[Service] U.S. Fish and Wildlife Service. 2021. Five-year review: *Ambrosia pumila* (San Diego ambrosia) 19 pp.

San Diego Button-Celery

Listing Status

San Diego button-celery was federally listed as endangered on August 3, 1993, due to habitat loss and degradation from urban and agricultural development, livestock grazing, off-road vehicle use, trampling, invasion from weedy non-native plants, and other factors (58 FR 41384).

Life History and Habitat

San Diego button-celery is a biennial or longer-lived perennial gray-green herb that has a storage tap root. It has a spreading shape and reaches a height of 16 inches. The stems and lanceolate leaves give the plant a prickly appearance. It is a clay soil, surface and non-surface hard pan, vernal pool obligate and relies on ephemerally wet conditions to reproduce, blooming from April to June. It is an outcrossing taxon that reproduces exclusively by seeds (Service 2010).

Population Status

San Diego button-celery currently occurs in 14 geographic areas in Riverside and San Diego counties. Collection records document occurrences in six areas of Riverside County at listing; however, there are now only four sites, all on the Santa Rosa Plateau (Service 2010). Most of the occupied range of the taxon in the United States occurs in ten regional locations in San Diego County including Marine Corps Base Camp Pendleton, Carlsbad, San Marcos, Ramona, Del Mar Mesa, Carmel Mountain, Mira Mesa, Marine Corps Air Station Miramar, Otay Lakes, and Otay Mesa (Service 2010). Additionally, there are several known occurrences in northwest Baja California from La Misión to San Quintín (Rebman *et al*. 2016, p. 35).

San Diego button-celery can be locally abundant in remnant vernal pools; however, the distribution of this variety has been dramatically reduced due to loss of most (95 to 97 percent) of the vernal pool habitat in San Diego County. In 2003, the City of San Diego conducted a survey of vernal pools within their jurisdiction; these surveys revealed that of the 69 sites surveyed, 28 contained San Diego button-celery and it was found on 20 of 36 acres of basin habitat. Based on survey data at Marine Corps Air Station Miramar that incorporates survey efforts since 1993, San Diego button-celery was found in 20 of 45 vernal pool complexes located on the installation (Service 2010). The species is extant or presumed extant at approximately 98 locations within the Unites States. At least 26 locations in the United States are considered extirpated or possibly extirpated. There are likely many more extirpated locations that were not recorded prior to development, because by 1978, 90 percent of vernal pool habitat in San Diego County was already lost (Beauchamp 1979, p. 1). The isolated populations newly documented in Orange County and 100 miles farther south in Baja California appear to be outliers, and the core distribution in Riverside and San Diego Counties remains mostly unchanged.

At the time of listing, all sites occupied by San Diego button-celery were under threat of development or other impacts. Overall, San Diego button-celery has maintained its population and distribution since the time of listing. Though threats remain, impacts from trampling associated with immigrant travel, road development and construction activities, and mowing and plowing of extant habitat have been minimized as threats. Outside of continued urbanization, climate change and fire may have the longest lasting impact for degrading the species long term retention, setting back potential recovery. The dense concentrations of vernal pools on military bases will be protected from most development but may be subject to off-highway vehicle activity, trampling impacts, and potential habitat impacts if Marine Corps Base Camp Pendleton or Marine Corps Air Station Miramar requires a change in the military mission (Service 2010).

Much progress has been made to conserve vernal pool habitat where San Diego button-celery occurs. Land acquisition and conservation under the Western Riverside County Multiple Species Habitat

Conservation Plan and San Diego Multiple Species Conservation Plan, as well as management efforts under the Marine Corps Air Station Miramar and Marine Corps Base Camp Pendleton Integrated Natural Resource Management Plans, have reduced or ameliorated many of the original threats. Regardless, though San Diego button-celery is found to be locally abundant at sites where habitat has been conserved or where management of anthropogenic activities has protected the vernal pool site, impacts from current threats remain (Service 2010).

Recovery Plan Information

A recovery plan for San Diego button-celery and other vernal pool species was released on September 3, 1998 (Service 1998) and a clarification to this plan was released on October 1, 2019 (Service 2019). The delisting criteria include the following:

1) All 74 geographic areas and associated vernal pool complexes as identified in Appendices F and G of the 1998 Recovery Plan under each of the specific management areas are protected and managed to ensure long-term viability.
2) The Service must determine that the following factors are no longer present, or continue to adversely affect, San Diego button-celery: (a) the present or threatened destruction, modification, or curtailment of their habitat range; (b) over utilization for commercial, recreational, scientific, or educational purposes; (c) disease or predation; (d) the inadequacy of existing regulatory mechanisms; and (e) other natural and manmade factors affecting their continued existence.
3) Population trends continue to be stable or increasing for 10 consecutive years after threats have been sufficiently ameliorated or managed completion of delisting criterion 2 prior to consideration for delisting.

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[Service] U.S. Fish and Wildlife Service. 2010. (*Eryngium aristulatum* var. *parishii*) San Diego button celery 5-year review: summary and evaluation. 62 pp.

San Diego Mesa-Mint

Listing Status

San Diego mesa-mint was federally listed as endangered under the Act in September 1978 and by the California Endangered Species Act (CESA) in 1979. The listing occurred after the Service determined that the existence of San Diego mesa-mint was threatened by past degradation of and future loss of habitat (43 FR 44810).

Life History and Habitat

San Diego mesa-mint is an annual herb in the Lamiaceae (mint family) that is restricted to vernal pools in southern California. Plants can reach 30 centimeters (1 foot) or more in height and flowers are arranged in whorls that typically bloom from May or June through early July. The plants usually give off a strong, sweet mint odor.

San Diego mesa-mint seeds germinate depending on the inundation and drying cycles of vernal pools. For many vernal pool plant taxa, temperature and moisture affect the timing of plant germination (Myers 1975, p. 67). The link between the onset of germination, temporal conditions associated with vernal pool inundation, temperature, and moisture are critical to the germination, maturation, flowering, and fruiting of the plant. The interaction of these factors provides the plants favorable conditions in the spring rather than in the summer, autumn, or winter. Natural differences in the precipitation and the inundation/drying time of vernal pools from year to year may influence the distribution and abundance of San Diego mesa-mint. These environmental factors make it difficult to obtain an accurate measure of the population. Additionally, a portion of the population is represented by seeds remaining in the seed bank and is not accounted for each year.

San Diego mesa-mint usually blooms in May and June when water is absent from the vernal pool (Munz 1974, p. 531). The plants produce fruit, dry out, and senesce in the hot, dry summer months. Pollination of the plant was described by Schiller et al. (2000, p. 392) by monitoring insect visitors to individual plants on Del Mar Mesa. They found the Eurasian honey bee (Apis mellifera) and two anthophorid bees (Exomalopsis nitens and E. torticornis) to be the most common and likely pollinators of the plant. They also documented that San Diego mesa-mint is selffertile but has greater seed set when cross-pollinated (Schiller et al. 2000, p. 393).

Little species-specific data exists detailing San Diego mesa-mint habitat requirements other than it is found exclusively associated with vernal pools. It is often found with *Eryngium aristulatum var. parishii* (San Diego button-celery) and the San Diego fairy shrimp (*Branchinetcta sandiegonensis*). Vernal pools containing San Diego mesa-mint typically occur on gravelly loams that are saturated or inundated seasonally, subsequently dry out and remain dry for about 6 to 8 months through the summer. The surface substrates are underlain by a subsoil of clay, or by a silicacemented hardpan layer that prohibits drainage and creates a perched water table that forms the vernal pool. Vernal pools that support San Diego mesa-mint are found on Redding soils, the second most common of the five pool-supporting soils in San Diego County (Beauchamp 1979, p. 26; Bauder and McMillan 1998, pp. 61–62). These are well-drained gravelly loams that have gravelly clay subsoil and a hardpan (USDA 1973, p. 71).

Typically vernal pool species require a certain amount and duration of inundation each year. The vernal pool habitat is neither terrestrial nor aquatic, but rather a combination of both (Bauder 2000, p. 44; Zedler 1987, p. 1). San Diego mesa-mint is considered an obligate wetland species (found almost always in wetland areas), but is more tolerant of the inundation/drying cycles of vernal pool habitat than a true wetland plant.

Population Status

Suitable habitat for San Diego mesa-mint is limited to vernal pools in San Diego County, California. The Recovery Plan (1998) identifies the northern distribution for the plant as Del Mar Mesa. It occurs south on Mira Mesa, MCAS Miramar, and Kearny Mesa with a few scattered populations in western Tierrasanta. Historically, the plant was found near University Heights, Balboa Park, and Linda Vista but were initially believed to be Otay mesa-mint (CDFW 2022). Herbarium records verified the specimens collected at University Heights and Balboa Park to be San Diego mesa-mint instead of Otay mesa-mint. All three occurrences were extirpated at listing. We consider the current distribution of San Diego mesa-mint to be limited to southern San Diego County (Service 2023).

There are 43 distinct San Diego mesa-mint locations still potentially occupied, of which 36 are extant and 7 are presumed extant. There are 25 locations that are considered extirpated or possibly extirpated, of which 22 are extirpated and 3 are possibly extirpated. A total of 22 locations have been extirpated since listing (3 occurrences that were historically occupied were considered extirpated prior to listing) and several past occurrences from the 2010 5-year review have been split into new, more specific occurrences. Vernal pool restoration sites MV-22 and Del Mar Mesa – Zamudio represent new occurrences for the species that did not exist during the 2010 5-year review. It is also possible that San Diego mesa-mint occurs at other locations that have not been surveyed or detected (Service 2023).

Recovery Plan Information

A recovery plan for San Diego mesa-mint and other vernal pool species was released on September 3, 1998 (Service 1998) and a clarification to this plan was released on October 1, 2019 (Service 2019). The delisting criteria include the following:

1) All 74 geographic areas and associated vernal pool complexes as identified in Appendices F and G of the 1998 Recovery Plan under each of the specific management areas are protected and managed to ensure long-term viability.
2) The Service must determine that the following factors are no longer present, or continue to adversely affect, San Diego mesa-mint: (a) the present or threatened destruction, modification, or curtailment of their habitat range; (b) over utilization for commercial, recreational, scientific, or educational purposes; (c) disease or predation; (d) the inadequacy of existing regulatory mechanisms; and (e) other natural and manmade factors affecting their continued existence.
3) Population trends continue to be stable or increasing for 10 consecutive years after threats have been sufficiently ameliorated or managed completion of delisting criterion 2 prior to consideration for delisting.

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San Jacinto Valley Crownscale

Listing Status

The San Jacinto Valley crownscale (*Atriplex coronata* var. *notatior*) was listed as threatened on October 13, 1998 (63 FR 54975–54994). No critical habitat is designated for the San Jacinto Valley crownscale.(78 FR 22625 22658, April 16, 2013).

Life History and Habitat

Atriplex coronata var. *notatior* (San Jacinto Valley crownscale), a member of the goosefoot family (Chenopodiaceae), was described by Epson (1914), based on a specimen he collected in 1901 from the dried bed of San Jacinto Lake (= Mystic Lake), Riverside County, California. Hall and Clements (1923) considered this taxon a minor variant and submerged it in *A. coronata. Atriplex coronata* var. *notatior* has subsequently been recognized by Munz (1935, 1974) and Taylor and Wilken (1993) *Atriplex coronata* var. *notatior* is an erect, gray-scurfy annual, 1 to 3 decimeters (dm) (4 to 12 in) tall. The grayish leaves are sessile, alternate, 8 to 20 mm (0.3 to 0.8 in) long and elliptic to ovate-triangular in outline. This taxon is monoecious (male and female flowers on the same plant). The female flowers are obscure and develop spherical bracts in the fruiting phase. These bracts have dense tubercles (nodule) that are roughly equal in number to the marginal teeth (Munz 1974, Taylor and Wilken 1993). *Atriplex coronata* var. *notatior* can be distinguished from the more northern *A. coronata* var. *coronata* by its erect stature, the spheric shape of the bracts together in fruiting stage, and the more numerous tubercles and marginal teeth on the bracts. The distributions of the two varieties do not overlap. *Atriplex coronata* var. *coronata* is found in the Sacramento, San Joaquin, and neighboring valleys, while *A.c.* var. *notatior* is restricted to Riverside County. *A.c.* var. *notatior* occurs with eight other native and one introduced species of *Atriplex* within its range (D. Bramlet 1993b, Bramlet *in litt.* 1995, U.S. Fish and Wildlife Service, unpubl. data). It can be distinguished from these taxa by a combination of characteristics, including annual habit, the shape of the leaf, and the size and form of the bract (Munz 1974, Taylor and Wilken 1993).

Atriplex coronata var. *notatior* is restricted to highly alkaline, silty-clay soils in association with the Traver- Domino-Willows soil association (see Soil Conservation Service and Bureau of Indian Affairs 1971 for soil descriptions). Most populations are associated with the Willows soil series. It occurs in alkali sink scrub, alkali playa, vernal pools, and, to a lesser extent, in annual alkali grassland communities (Bramlet 1993a, Roberts 1993b). These areas are typically flooded by winter rains. The duration and extent of flooding are extremely variable from one year to the next. *A. coronata* var. *notatior* germinates after the water has receded. It usually flowers in April and May and sets fruit by May or June (D. Bramlet, *in litt.* 1992).

Population Status

Atriplex coronata var. *notatior* is restricted to the San Jacinto, Perris, Menifee and Elsinore Valleys of western Riverside County, California. This taxon consists of 15 population centers that are primarily associated with the San Jacinto River Valley, the western side of the floor of the Hemet Valley, and the plains flanking Salt Creek near Domenigoni Parkway and the rural community of Winchester (Roberts 1993b, Roberts and McMillan 1997, CNDDB 1997). One additional isolated and small population has recently been discovered on Willows soils near Lake Elsinore (Roberts and McMillan 1997).

The number of individuals of *Atriplex coronata* var. *notatior* in a population complex varies in any given year in response to rainfall, extent of winter flooding, and temperature. Disturbance (discing, dryland farming, pipeline construction, out of season inundation) has become an increasingly important factor in limiting the number of individuals in a population. Between 1990 and 1994, an estimated 78,000 *Atriplex coronata* var. *notatior* individuals were located (Metropolitan Water District (MWD) 1992, Ogden 1993, D. Bramlet, *in litt.* 1993, CNDDB 1997, Roberts 1993b). These plants occupied about 145 ha (400 ac) of about 3,300 ha (8,200 ac) of potentially suitable habitat (alkali scrub, alkali playa, and annual alkali grassland vegetation associations). The majority of the individuals (about 75 percent) were associated with three population centers (Mystic Lake, the Nuevo-Ramona Expressway segment of the San Jacinto River, and west Hemet) (Roberts 1993b). Since 1993, the population has apparently declined significantly as a result of major flooding in the winter of 1992–1993 and the subsequent conversion or alteration of potential habitat (Roberts and McMillan 1997).

Several new populations have since been discovered near historic populations (e.g., 5,200 individuals on the San Jacinto River and fewer than 200 individuals near Elsinore, California). However, new discoveries have not appreciably balanced the reduction of populations due to activities and events described above. About 45 ha (115 ac) of nearly 2,200 ha (5,500 ac) of available potentially suitable habitat are currently occupied by about 26,500 individuals of *A. coronata* var. *notatior.* About 12 ha (30 ac) of 1,000 ha (2,500 ac) of marginal habitat that has been substantially disturbed are currently occupied by about 500 individuals of this taxon (Roberts and McMillan 1997). *Atriplex coronata* var. *notatior* appears to have declined about 70 percent since 1992.

The majority of the population centers of *A. coronata* var. *notatior* are located on privately owned lands. Three populations are on State land (San Jacinto Wildlife Area), one population is partially on County lands (RCHCA along the San Jacinto River), and one population is on a private preserve managed by MWD. This plant is not known to occur on Federal lands.

Recovery Plan Information

No formal Recovery Plan has been published for the crownscale. Recovery of this species could be accomplished by (1) conserving extant populations of the crownscale, and by (2) placing unoccupied flatland habitat on saline-sodic soils into conservation for the crownscale within its historic range and then reintroducing the crownscale to such locations. Mitigation for impacting the crownscale can play an important role in recovering the species by implementing either recovery strategy #1 and/or #2.

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San Joaquin Valley Orcutt Grass and its Critical Habitat

Listing Status

The San Joaquin Orcutt grass (*Orcuttia inaequalis*) was listed as threatened on March 26, 1997 (62 FR 14338). Critical habitat was designated for the San Joaquin Orcutt grass on February 10, 2006 (71 FR 7118).

Life History and Habitat

Typical landforms upon which *Orcuttia inaequalis* occurs include remnant alluvial fans and stream terraces as well as tabletop lava flows. *O. inaequalis* is known to occur in acidic soils with textures ranging from clay to sandy loam. It has been documented on the Hideaway soil series on Fresno and Madera County tabletops, and Amador, Cometa, Corning, Greenfield, Los Robles, Madera Peters, Pollasky-Montpellier complex, Raynor, Redding and San Joaquin soil series throughout its range (Recovery Plan). Vollmar (2002) reported that *O. inaequalis* populations occur on Riverbank, North Merced Gravels, and Mehrten geologic surfaces, which could relate to the tendency of these surfaces to support larger pools, noting that soil characteristics may also play a role (USFWS 2013).

O. inaequalis is a highly specialized C4 plant (an evolutionary adaptation that facilitates photosynthetic productivity in arid and semi-arid climates) that is dependent on deep vernal pools for survival (USFWS 2013). Species inhabits mall, seasonal pools (NatureServe, 2015). High ecological integrity of the population and site fidelity as well as low tolerance ranges are inferred based on the specific habitat needs of this species and its relatively small geographic range.

Spikelets break apart and scatter their seeds when autumn rains arrive (USFWS 2005).

One reproductive quality observed in Orcuttia species that promotes high genetic variation among successive generations is the flowering pattern. *O. inaequalis* is wind-pollinated, and generally flowers from April to September. The first two flowers on plants of these species open simultaneously and do not produce pollen until the ovaries are no longer receptive. Thus, fertilization for these flowers is solely a result of outcrossing from different plants (USFWS 2013).

Population Status

Rangewide Status of the Species

The historical range of the San Joaquin Orcutt grass is believed to be in the Southern Sierra Foothills Vernal Pool Region, which includes parts of Stanislaus, Merced, Madera, Fresno and Tulare counties, California (USFWS 2013).

The current range of the San Joaquin Orcutt grass includes portions of: Solano, Merced, Madera, Fresno, and Tulare counties, California (USFWS 2013).

Population Summary

At least 16 populations of *O. inaequalis* have been extirpated; 23 populations remain, all within a 79 km-long range (NatureServe 2015).

Across the contemporary range, 14 of 31 (45%) extant O. *inaequalis* localities are currently protected or proposed for protection. Direct impacts from the threat of land conversion or urbanization are currently, or have potential to be, excluded from these localities. Conversely, 17 extant occurrences have no known protection at this time, and therefore continue to be vulnerable to threats. Moreover, the potential effects of climate change could threaten the stability of all localities for this highly specialized species that is dependent upon a specific set of environmental conditions (USFWS 2013).

Threats

Threats to this species include:

- The vast majority of land on the Central Valley floor has potential for urbanization and agricultural conversion due to flat topography and its vicinity to existing infrastructure (USFWS 2013).
- Hydrologic modifications from human activities have both benefited and impacted *O. inaequalis* populations (USFWS 2013).
- While improperly timed grazing can negatively impact the plant and its habitat, research by Marty (2004 and 2005) indicates that livestock grazing plays an important role in maintaining species diversity in vernal pool grasslands through control of invasive species. Direct consumption of *O. inaequalis* by grazers in the winter and early spring may be limited, due to the fact that the majority of the plants have not emerged or are in the aquatic growth stage of the lifecycle. Nonetheless, impacts to *O. inaequalis* plants, as a result of improper grazing regimes, are still recognized as a threat to extant populations (USFWS 2013).
- The Recovery Plan included foraging during grasshopper outbreaks as a potential reason for decline of the species in certain areas. Although grasshoppers have been observed on *O. inaequalis* plants at two localities, this species appears to be only slightly susceptible to grasshopper predation. This characteristic has been attributed to the viscidaromatic (sticky, fragrant) exudate produced by *Orcuttia* species, which may act as an effective deterrent to grasshoppers (USFWS 2013).
- Soil disturbance from overgrazing by cattle may adversely affect *O. inaequalis* indirectly by facilitating invasive plant species (USFWS 2013).
- *O. inaequalis* occurrences on private lands may be threatened by off-road vehicle use (USFWS 2013).
- Vulnerability of *O. inaequalis* from small populations. annual precipitation affects both seed production and seed germination. Therefore the number of individuals that make up a given population of *O. inaequalis* can vary widely from year to year. In fact, some extant localities do not appear during dry years and appear the next year, under more favorable rainfall conditions, with plants numbering in the thousands (USFWS 2013).
- Climate change is also a threat to this species (USFWS 2013).

Five-Year Status Review

On August 7, 2013, the USFWS issued a five-year status review of the San Joaquin Orcutt grass, which resulted in no change in listing status (USFWS 2013).

Critical Habitat

Critical habitat was designated for the San Joaquin Orcutt grass on February 10, 2006 (71 FR 7118). The critical habitat designation for *Orcuttia inaequalis* includes six units in Fresno, Madera, Mariposa, Merced, and Tulare counties, California. This species critical habitat encompasses approximately 136, 312 acres (ac) (55,164 hectares (ha)) (71 FR 7118).

- Unit 1: Merced and Mariposa counties, California. From USGS 1:24,000 topographic quadrangles Snelling, Merced Falls, Winton, Yosemite Lake, Haystack Mountain, Indian Gulch, Merced, and Owens Reservoir.
- Unit 2: Merced, Madera, and Mariposa counties, California. From USGS 1:24, 000 topographic quadrangles Owens Reservoir, Plainsburg, Le Grand, and Raynor Creek.

- Unit 3: Madera County, California. (i) Unit 3A: Madera County, California. From USGS 1:24,000 topographic quadrangle Kismet. (ii) Unit 3B: Madera County, California. From USGS 1:24,000 topographic quadrangles Daulton, Little Table Mountain, Gregg, and Lanes Bridge. (iii) Unit 3C: Madera County, California. From USGS 1:24,000 topographic quadrangle Lanes Bridge.
- Unit 4: Fresno County, California. From USGS 1:24,000 topographic quadrangle Friant.
- Unit 5: Madera County, California. (i) Unit 5A: Madera County, California. From USGS 1:24,000 topographic quadrangles North Fork and Millerton Lake East. (ii) Unit 5B: Fresno County, California. From USGS 1:24,000 topographic quadrangles Millerton Lake East and Academy.
- Unit 6: Tulare County, California. (i) Unit 6A: Tulare County, California. From USGS 1:24,000 topographic quadrangle Monson. (ii) Unit 6B: Tulare County, California. From USGS 1:24,000 topographic quadrangle Monson. Unit 6C: Tulare County, California. From USGS 1:24,000 topographic quadrangle Ivanhoe. Unit 6D: Tulare County, California. From USGS 1:24,000 topographic quadrangle Woodlake.

Primary constituent elements (PCEs) are the physical and biological features of critical habitat essential to a species' conservation. The PCEs of *Orcuttia inaequalis* critical habitat consists of two components (71 FR 7118):

(i) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools described in paragraph (ii) of this section, providing for dispersal and promoting hydroperiods of adequate length in the pools; and

(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and nonnative upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the San Joaquin Orcutt grass (USFWS 2005).

Recovery Actions

- The amount of existing suitable habitat across the range has not been determined and the Service does not currently have sufficient information to quantify either the acreage of suitable habitat within each core area or the acreage of protected suitable habitat for *O. inaequalis* (USFWS 2013).

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San Joaquin Wooly-Threads

Listing Status

The Service listed the San Joaquin wooly-threads as endangered on July 19, 1990 (Service, 1990). The Service has not designated critical habitat for this species.

Life History and Habitat

The San Joaquin wooly-threads is an annual herb in the sunflower family. The common name 'wooly-threads' is derived from the many long, trailing stems covered with tangled hairs, which can measure up to 18 inches long. This species occurs in the grasslands of the hills and plateaus on the west side of the San Joaquin Valley and is associated with valley saltbrush scrub habitat on the valley floor.

The San Joaquin wooly-threads is a small flowering annual in the sunflower family, with most of the plant often being less than three inches wide, except for the long, trailing stems covered with tangled hairs. It has tiny yellow flower heads that are 0.25 inch long, but despite their small size, each flower head has many flowers within it. The leaves are narrow and lobed, and covered in pale wooly fibers.

The San Joaquin wooly-threads is found in non-native grassland, valley saltbush scrub, interior coast range saltbush scrub and upper Sonoran subshrub scrub communities. It grows in neutral to sub-alkaline soils. On the San Joaquin Valley floor, this species typically is found on sandy or sandy loam soils, whereas on the Carrizo Plain, it grows in silt rich soils. The San Joaquin wooly-threads also grows in sand dunes and on sandy ridges, as well as along the high-water line of washes and on nearby terraces. This species has been found in elevations ranging from 200 to 2,600 feet.

Seeds may sprout as early as November, but more often in December and January. The San Joaquin wooly-threads typically flowers between late February and early April, and do not seem to require insect pollination. Each plant may have anywhere from one to 400 flower heads. Tiny yellow flower heads are clustered at the tips of the stems and branches. Each flower head has two types of even tinier flowers: four to seven ray flowers and numerous inner disc flowers. These two types of flowers produce one-seeded fruits that also differ in shape. The number of seeds a plant makes depends on plant size and the number of flower heads but can range from 10 to 2,500 seeds. In April or May, once the seeds are dropped, the plant dies and dries up, becoming unnoticeable on the landscape.

This plant is threatened by habitat loss due to urban and agricultural development; oil, gas, and other mining exploration; competition with invasive non-native species, and climate change.

Population Status

Historically, the San Joaquin wooly-threads was found in seven California counties: San Benito, Fresno, Kings, Tulare, Kern, San Luis Obispo, and Santa Barbara. By the time of listing in 1990, the species no longer occurred in Tulare County. Today, there are extant populations spread across Fresno, Kern, Kings, San Benito, San Luis Obispo, and Santa Barbara counties. Additional occurrences have been reported since the Service's 2010 status review of the species, but these do not significantly extend the range and distribution of the San Joaquin wooly-threads (Service, 2020).

Recovery Plan Information

The San Joaquin wooly-threads recovery strategy is described in the Recovery Plan for Upland Species of the San Joaquin Valley, California (Service, 1998). The downlisting and delisting criteria for the San Joaquin wooly-threads include the following (Service, 1998; Service, 2020):

Downlisting

1. Secure and protect specified recovery areas from incompatible uses:

    a. 95% of occupied habitat on public lands;
2. Management Plan approved and implemented for all protected areas identified as important to the species' continued survival.
3. Population monitoring in specified recovery areas shows stable or increasing populations in all protected areas through one precipitation cycle.

Delisting
1. Secure and protect specified recovery areas from incompatible uses:
    a. 640 acres (260 hectares) or more of occupied habitat in the Lost Hills area;
    b. One or more other sites on the San Joaquin Valley floor of 640 acres (260 hectares) or more.
2. Management Plan approved and implemented for all protected areas identified as important to the species' continued survival.
3. Population monitoring in specified recovery areas shows no decline after downlisting. If declining, determine the cause and reverse the trend.

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Santa Clara Valley Dudleya

Listing Status

Santa Clara Valley dudleya was listed as endangered on February 3, 1995 (60 FR 6671).

Life History and Habitat

The Santa Clara Valley dudleya is a low-growing perennial succulent with pale-yellow flowers that grows in rocky outcrops in serpentine grasslands (USFWS 1998). It is part of the stonecrop family and has fleshy, hairless leaves. The oblong to triangular leaves are covered with a whitish or bluish waxy or powdery film. The leaves are 1 to 3 inches long and 0.3 to 0.6 inch wide. Two or three flowering stems ascend to heights of 2 to 8 inches in mid- to late spring. The pale-yellow petals are 0.3 to 0.5 inch long (USFWS 1998)

Santa Clara Valley dudleya flowers from May to June and produces seeds that are dispersed by the wind (USFWS 1998). The species can also reproduce vegetatively by forming rosettes that can either separate from the parent plant or remain attached (USFWS 1998).

At the time of listing, the primary threats to the Santa Clara Valley dudleya were identified as development, landfill activities, unauthorized dumping, and off-road vehicles (60 FR 6671). The final listing rule also noted that urban development has fragmented serpentine plant populations, increasing the risk of extinction due to chance events such as fire, pest or disease outbreaks, reproductive failure, or other natural or human-caused disaster (60 FR 6671). Threats to the species identified at the time of the 2013 5-year review include all the original threats identified at the time of listing, as well as nitrogen deposition, climate change, and change of land management due to urban development (USFWS 2013). Although some of the previously mentioned threats have been addressed at occurrences protected by the Santa Clara Valley Habitat Conservation Plan/Natural Community Conservation Plan (ICF International 2012), there is no evidence that the status of these threats has changed outside of these protected areas (USFWS 2021). Furthermore, the risk of catastrophic fire outside of fully developed areas in the San Francisco Bay Area is an increasing concern (Ackerly et al. 2018) and in 2020 a large fire complex, known as the SCU lightning complex, burned 396,624 acres over six counties, including Santa Clara County (CalFire 2021). This increased fire risk puts already fragmented populations at further risk of extinction, as mentioned in the final listing rule (60 FR 6671).

Population Status

The Santa Clara Valley dudleya is found only in the Coyote Valley area of Santa Clara County, California, from San Jose south about 25 miles to Gilroy. At the time of listing in 1995, the Santa Clara Valley dudleya was known from fourteen sites (USFWS 1998). Currently there are 59 known occurrences (USFWS 2021).

Recovery Plan Information

On September 30, 1998, the Service issued the Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area, which includes the Santa Clara Valley dudleya (USFWS 1998).

The downlisting criteria for the species include (USFWS 1998):

1. Secure and protect occupied habitat or 20 populations representing the range of the species along with adjacent unoccupied habitat and a 150-meter (500-foot) buffer. Representation of the species includes: three populations north of the Santa Teresa Hills U.S. Geological Survey (USGS) 7.5 minute quadrangle, at least one population in the southern portion of the range (Gilroy USGS 7.5 minute quadrangle map), and at least 14 populations in the center of the species range, with at

least one center population within the westernmost extent of the range (Los Gatos USGS 7.5 minute quadrangle).

2. Management plan approved and implemented for all populations and any occupied or unoccupied habitat identified as essential to survival.

3. Population monitoring shows stable or increasing populations for a period of 20 years that include the normal precipitation cycle (or longer if suggested by the results of demographic monitoring).

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Santa Monica Mountains Dudleya

Listing Status

The Service listed the Santa Monica Mountains dudleya (*Dudleya cymosa* subsp. *ovatifolia* [inclusive of the Agoura Hills liveforever (*D. cymosa* subsp. *agourensis*)]) as threatened in 1997 (Service 1997, entire). We completed a final recovery plan in 1999 (Service 1999, entire) and released 5-year reviews in 2009 and 2021 (Service 2009, entire; 2021, entire).

As discussed in the listing rule (Service 1997, entire), the recovery plan for this species (Service 1999, entire), and the 5-year reviews (Service 2009, entire; 2021, entire), we listed *Dudleya cymosa* subsp. *ovatifolia* including the plants now identified as *D. cymosa* subsp. *ovatifolia* (Santa Monica Mountains dudleya), the plants currently recognized as *D. cymosa* subsp. *agourensis* (Agoura Hills liveforever), and *D. cymosa* plants in the Santa Ana Mountains (Orange County, California) that were formerly identified as *D. cymosa* subsp. *ovatifolia* (Service 1997, entire). Both named subspecies are currently recognized as separate and distinct taxa (Service 2009, pp. 2-3; 2021, pp. 2-3; McCabe 2012, pp. 669-670; California Native Plant Society (CNPS) 2017, p. 1; California Natural Diversity Data Base (CNDDB) 2008, entire) and the *D. cymosa* plants in the Santa Ana Mountains are not *D. cymosa* subsp. *ovatifolia*, but rather represent either an undescribed subtaxon of *D. cymosa* or a group of plants that are intermediate between other recognized *D. cymosa* subspecies (S. McCabe, botanist, in litt. 2017, entire; Hasenstab-Lehman and Guilliams 2020, p. 27). Because of the potential for these taxonomic and nomenclatural changes to cause confusion in this biological opinion, we use the following names to refer to each entity: When we are discussing the entity that occurs on the south face of the Santa Monica Mountains that is currently recognized as *D. cymosa* subsp. *ovatifolia*, we will use the common name “Santa Monica Mountains dudleya”. When we are discussing the entity that occurs on the north face of the Santa Monica Mountains that is currently recognized as *D. cymosa* subsp. *agourensis*, we will use the common name “Agoura Hills liveforever”. When we are discussing the aggregate of these plants, as we listed them in 1997, (inclusive of *D. cymosa* subsp. *ovatifolia* and *D. cymosa* subsp. *agourensis*), we will use the common name “canyon dudleya”.

In this biological opinion, we are evaluating the status of all populations that were identified as *D. cymosa* subsp. *ovatifolia* at the time of listing that occur in the Santa Monica Mountains. The canyon dudleya plants in the Santa Ana Mountains were recently analyzed and determined not to be *D. cymosa* subsp. *ovatifolia* (McCabe, In litt. 2017, entire; Hasenstab-Lehman and Guilliams 2020, p. 27). McCabe has determined they belong to another named taxon and is in the process of publishing a new name. While the identity of the Santa Ana Mountains *Dudleya* are not know unequivocally, the fact that they are not Santa Monica Mountains dudleya is important for our effects analysis. Additionally, the Santa Ana Mountains canyon dudleya plants occur outside of the boundaries of proposed project. They will not be discussed further in this biological opinion because they are beyond the scope of the proposed project.

Life History and Habitat

The Santa Monica Mountains dudleya and Agoura Hills liveforever are succulent, rosette-forming perennial plants with thickened, exposed stems in the Crassulaceae (stonecrop family). The ovate leaves that have a maroon underside distinguish the Santa Monica Mountains dudleya from other local *Dudleya* species, and the glaucous (chalky) leaves and lemon-yellow flowers distinguish Agoura Hills liveforever from other local *Dudleya* species.

The Agoura Hills liveforever grows on exposed, northerly facing talus slopes and rock outcrops of volcanic origin. The plants occur in or next to thin hummocks of spikemoss, moss, and lichens and in cracks or pockets in the rock surface. At two locations, part of the Agoura Hills liveforever population occurs on rocky soil exposed by road cuts (Dorsey et al. 2013, p. 10).

The Santa Monica Mountains dudleya occurs on sandstone conglomerate rock outcroppings (Topanga formation) on northerly facing vertical canyon walls above perennially or ephemeral streams, locations that remain relatively cool even in warmest months. Most plants grow directly on the rock face and occasionally in thin soils collected in concavities. On the upper, less vertical portions of outcroppings it occurs in beds of spikemoss and moss. Compared to other *Dudleya* taxa, mosses and lichens are relatively uncommon at the sites where Santa Monica Mountains dudleya grows (Dorsey et al. 2013, p. 22).

For additional information regarding the species and its biology, see the final listing rule (Service 1997), recovery plan (1999), and 5-year reviews (Service 2009, 2021).

Population Status

The Agoura Hills liveforever occurs or has been reported to occur at nine locations. Six of these are listed in the CNDDB, three are locations reported by the U.S. National Park Service that fall beyond a quarter-mile from the nearest CNDDB location. Plants were also found at an additional location not listed in the CNDDB, southeast of Las Virgenes Reservoir (Dorsey et al. 2013, p. 21). A population census from a 2013 report indicated there were about 15,000 plants at 4 occurrences (Dorsey et al. 2013, p. 17). More recently estimates from 2021 for the Agoura Hills liveforever indicated about 25,000 individuals in 8 occurrences (Guilliams and Hasenstab-Lehman 2021, p. 35).

There are only two known occurrences of Santa Monica Mountains dudleya in the Santa Monica Mountains; one occurs in the middle reaches of Malibu Canyon and one occurs in the middle reaches of Topanga Canyon. There were fewer than 900 individuals at these two sites (Dorsey et al. 2013, p. 25). Recently estimates from 2021 for the Santa Monica Mountains dudleya indicated about 2,000 individuals in 2 occurrences (Guilliams and Hasenstab-Lehman 2021, p. 37).

<u>*Threats*</u>

Development - The Agoura Hills liveforever occurrences are on privately owned properties, some zoned for commercial and residential development. A large, fairly contiguous population extends from Agoura Hills, at Kanan Road, west across the slopes of Ladyface Mountain, to the vicinity of Westlake Village. Most of the population occurs on lower slopes and could be affected by development; however, steep, rocky terrain may restrict development on portions of this population. Because of increasing development pressures, the species faces an ongoing threat of habitat loss.

In Malibu and Topanga Canyons, the Santa Monica Mountains dudleya mostly occurs on lands owned and managed by California Department of Parks and Recreation. The two occurrences are on lands managed as open space by the Conejo Open Space Conservation Agency.

Recreation - Recreational rock climbing has been recognized as a threat to the Santa Monica Mountains dudleya at Malibu Creek (EO 10) (J. Marek, in litt. 2009, Dorsey et al. 2013, pp. 27-28; Guilliams and Hasenstab-Lehman 2021, p. 46), with plants sometimes cleared away to make cleaner climbing routes. In October 2020, the climbing bolts on the Malibu Canyon occurrence were removed and the California Department of Parks and Recreation closed the area to recreation; however, it is expected to take many years for the site to recover (M. Elvin, pers. obs. 2021). The extent of recreational impacts on the Topanga Canyon occurrence (at EO 2) are unknown at this time (Service 2009).

Other more general recreational activities, particularly developed and social trail use, have resulted in the Agoura Hills liveforever being trampled in some areas (Dorsey et al. 2013, p. 18, Guilliams and Hasenstab-Lehman 2021, p. 41, CNDDB 2021), but this is a minor effect.

Illegal Collecting - Illegal collecting was identified as a threat at the 1997 listing, the 2009 5-year review, and recent surveys (Guilliams and Hasenstab-Lehman 2021, p. 46). However, even with a recent surge of *Dudleya* poaching in California (McConnell 2019, unpaginated), the collection of Agoura Hills liveforever is thought to be minor (Guilliams and Hasenstab-Lehman 2021, p. 46), and there no evidence of the Santa Monica Mountains dudleya being collected. An incident of removal of chalk dudleya (*D. pulverulenta*) occurred near a public access location in Topanga Canyon in 1999, illustrating that collection of *Dudleya* species continues to be a threat to members of this genus (R. Farris, in litt. 1999). Although there are no specific reports of unauthorized collection for Santa Monica Mountains dudleya or Agoura Hills liveforever, we believe that collection still constitutes a threat to the species.

Fire - In the 2009 5-year review, we identified fire as a potential threat to both the Santa Monica Mountains dudleya and Agoura Hills liveforever. Fire increased as a concern after the 2013 Springs Fire, which showed that a fire could effectively eliminate most of the individuals of a very narrowly distributed *Dudleya* species (*D. verityi*) in similar habitat (Dorsey et al. 2013, p. 9).

In late 2018, the Woolsey fire burned over almost all the occurrences of Agoura Hills liveforever and the Malibu Creek occurrence of the Santa Monica Mountains dudleya. Post-burn surveys in 2020 (Guilliams and Hasenstab-Lehman 2021, pp. 34, 41) showed that the burn severities were low for the burned occurrences, and that the plants were not affected much by the fire, with relatively high plant numbers at the burned occurrences.

Competition with Nonnative Species - Nonnative plants are a possible threat to both Santa Monica Mountains dudleya and Agoura Hills liveforever (Dorsey et al. 2013, pp. 18-19; CNDDB 2021; Guilliams and Hasenstab-Lehman 2021, p. 46). For Agoura Hills liveforever these are annual grasses, such as red brome (*Bromus rubens*) and ripgut brome (*B. diandrus*), and for Santa Monica Mountains dudleya these are various horticultural escapes. For both taxa, the current direct effects of competition are thought to be minor because the nonnatives generally occur adjacent to, not among, the *Dudleya* plants.

Stochastic Extinction - The 2009 5-year review recognized the susceptibility of Santa Monica Mountains dudleya and Agoura Hills liveforever occurrences to stochastic extirpation or extinction. Given the small number of occurrences and their small population sizes (see Table 1 in Service 2021), this is still a threat.

Climate Change - Current regional climate change models predict substantial changes by the end the century for the area in which Santa Monica Mountains dudleya and Agoura Hills liveforever are located (Hall et al. 2018, pp. 9-19). These changes include an increase in annual mean temperature by 5ºF, hotter maximum temperatures by 10ºF, increased variability of rainfall and extreme rainfall and drought events, and increased wildfire. Overall, the region will be hotter and drier.

While it is not known how Santa Monica Mountains dudleya and Agoura Hills liveforever will respond to these changing conditions, they could lead to local extirpations of rare species, or gradual shifts in range to areas that are still cool and moist enough to support rarer *Dudleya* populations. Increasing annual temperatures in California could lead to an increase of nonnative annual grasses (Sandel and Dangremond 2012). If annual grass cover increases around the Agoura Hills liveforever, both the competitive effects of the grass and the increased flammability could negatively impact the taxon. In this case, there could be a synergistic effect that compounds several threats- climate change favors non-native plants which increases fire risk.

Recovery Plan Information

The recovery plan for Santa Monica Mountains dudleya recommends the following: 1) protect and secure populations and habitat on protected lands; 2) use biological constraints analysis to avoid effects prior to development design; 3) educate landowners about ways to conserve the species on their land; 4) establish rare plant reserves that include Santa Monica Mountains dudleya; 5) manage and monitor protected areas to maximize their ability to support Santa Monica Mountains dudleya; 6) look for new populations of the species in potential habitat and confirm historical locations; 7) conduct scientific research to define life history and population dynamics, such as the influence of disturbance, dispersal mechanisms, pollinators, and ways to maintain open areas within habitat; 8) collect and store Santa Monica Mountains dudleya seeds in a seedbank to maintain genetic diversity; 9) develop outreach programs for private lands, protected lands, and lead agencies; 10) determine the effects of fire; and 11) identify additional potential habitat (Service 1999, pp. 42-49).

The recovery plan states that the Santa Monica Mountains dudleya can be evaluated for delisting when all current locations (including seedbanks) are fully protected and managed with the primary intention of preserving the populations in perpetuity and shown to be self-sustaining over a minimum of 10 years (Service 1999, p. 42).

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Slender Orcutt Grass and its Critical Habitat

Listing Status

Slender Orcutt grass (*Orcuttia tenuis*) was listed as threatened on March 26, 1997 (62 FR 14338). Critical habitat was designated for this species on February 10, 2006 (71 FR 7118).

Life History and Habitat

Slender Orcutt grass is a member of a small tribe (three genera and nine species) of semi-aquatic grasses that are unique among grasses in exhibiting single-cell C4 photosynthesis, which occurs in only 0.003% of known species of C4 flowering plants. Plants with C4 photosynthesis utilize a more complex biochemical process than most plants (with C3 photosynthesis) in converting CO_2 to energy, which increases photosynthetic efficiency at low CO_2 concentrations. The species is endemic to California vernal pools. Slender Orcutt grass occurs across a wide range of elevations (27-1,856 m, or 90-5,761 ft), but is associated primarily with vernal pool habitat on Northern Volcanic Ashflow and Northern Volcanic Mudflow substrates. The species is typically associated with larger and/or deeper vernal pools (typically ≥ 30 cm, or 11.8 in. deep) that have relatively long periods of inundation. The plant is also restricted to the deepest portion of the pools (Service 2005). The main habitat requirement for the plant appears to be inundation of sufficient duration and quantity to eliminate most competition and to meet the plant's physiological requirements for prolonged inundation, followed by gradual desiccation (Griggs and Jain 1983, Corbin and Schoolcraft 1990). However, pools that normally retain moisture until the end of summer allow out-competition of slender Orcutt grass by marsh vegetation (*Scirpus* spp., *Typha* spp.) (Griggs and Jain 1983).

Population Status

Disjunct occurrences of the species occur in vernal pools on remnant alluvial fans, high stream terraces, and recent basalt flows from the Modoc Plateau in northeastern California, west to Lake County, and south through the Central Valley to Sacramento County. The plant has also been reported from other natural and artificial seasonal wetlands such as creek terraces, stock ponds, and borrow pits; however, occurrence records suggest that most such locations are altered vernal pool habitats (CNDDB 2006).

Populations of slender Orcutt grass can vary greatly in size from year to year; fluctuations in population size of up to four orders of magnitude have been recorded. The grass germinates even in dry years, but the proportion surviving to maturity varies (Service 2005). Population trends for this species on managed or protected lands appear to be stable over time, although quantitative monitoring has apparently been discontinued at many sites. Ongoing monitoring of these occurrences does show large, inter-annual fluctuations in the number of living plants at many sites, with some years producing no living plants in some locations (C. Lentz *in litt*. 2006 in Service 2009, L. Serpa pers. comm. 2006 in Service 2009).

Recent surveys on the Modoc National Forest have located additional occurrences, thereby increasing the number of occurrences within the Modoc Plateau Vernal Pool Region (C. Beyer *in litt*. 2006a in Service 2009). Few additional occurrences have been discovered in other regions: one new occurrence has been found in the Southeastern Sacramento Valley Region, within Sacramento's urban development boundary. Its size and status are unknown (Sacramento County undated). Most occurrences on private lands were last evaluated in the late 1980s. At this time, the population trends for 61 occurrences are listed as unknown (CNDDB 2006).

Threats

The reduction and fragmentation of habitat due to urban development, flood control projects, landfill projects, highway development, and agricultural land conversion are listed as the primary threats to this species in the 1997 listing rule. Habitat degradation from agricultural and human-related changes to vernal pool hydrology is listed as an additional threat. Consistent with the 1997 rule, the largest continuing threat to this species is land type conversion and urban development along the periphery of urban areas, especially in the Redding and Sacramento areas (Service 2005, C. Martz in litt. 2006). For example, the new occurrence found within Sacramento's urban development boundary is currently threatened by surrounding development (Sacramento County undated). The population of California is expected to increase to 58 million, almost double the 1990 State population, by 2040 (Field et al. 1999). Between 1994 and 2005, the Sacramento FWS office engaged in Section 7 consultations for projects with impacts to approximately 20,250 ha (50,000 ac) of vernal pool habitat, including loss of 10,125 ha (25,000 ac) to residential, commercial, and industrial development (Service 2005). This loss is expected to continue as urban boundaries expand further through high and low terrace formations on the eastern side of the valley.

More subtle threats have the ability to change habitat suitability in natural lands remaining within the developed landscape. For example, loss of vernal pool habitat to residential, commercial, and industrial development can also lead to modification of remaining suitable habitat. Development can result in the loss of hydrological connections that sustain the remnant vernal pools. Vernal pool plants are sensitive to variations in the period of vernal pool inundation (Service 2009); populations of slender Orcutt grass could be impacted by such changes. On private lands, numerous pools with slender Orcutt grass occurrences have either been partially filled, or remain on relatively small parcels of lands adjacent to development (CNDDB 2006). Some pools have been partially drained, while others are inundated during longer periods of time due to nearby irrigation or runoff from development (CNDDB 2006).

Changes to vernal pool habitat associated with residential development include facilitation of the introduction of non-native plants to vernal pool habitats (Service 2009). Non-native grasses occur commonly in vernal pool complexes and have become a threat to native vernal pool plants through their capacity to change pool hydrology. Exotic grasses maintain dominance at pool edges, sequestering light and soil moisture, promoting thatch build-up, and shortening inundation periods. Although the mechanism responsible for the change in inundation is not documented, reduction in inundation period is thought to be due to increased evapotranspiration at the vernal pools (Marty 2005). In areas near the urban boundary, cattle-grazing is often discontinued in anticipation of land use changes (Service 2009). Cessation of cattle grazing has been found to exacerbate the negative effects of invasive non-native plants on vernal pool inundation period. The change in vernal pool inundation due to loss of grazing is an emerging threat for this species, especially in the Sacramento Valley (Service 2009). Vernal pool inundation was reduced by 50-80% in the Southeastern Sacramento Valley when grazing was discontinued (Marty 2005).

The vernal pools of the Modoc Plateau are not threatened by development, but habitat suitability for some populations may be modified by off-highway vehicle use and the alteration of pools by damming and excavating to provide cattle watering holes (and maintenance of alterations). These activities pose continued threats to individual populations. Numerous pools harboring slender Orcutt grass occurrences in this region have been fenced to exclude grazing and protect occurrences; however, cessation of grazing may have less effect on pool inundation in the Modoc Plateau region (Marty 2005, Service 2009).

Suitable habitat for this species may also be modified through changes to vernal pool hydrology at a relatively large scale. Recent research by Rains et al. (2006) has illustrated the manner in which many, if not most, vernal pools located on duripan or claypan in the Central Valley appear to be supported by perched aquifers. In these hydrological features, seasonal surface water and perched groundwater hydrologically connect uplands, vernal pools, and streams at the catchment scale. Perched groundwater discharges from uplands to vernal pools thereby stabilizing the pools, and causing them to remain inundated for longer periods than would be the case if they were recharged only by precipitation. Accordingly, small changes in local land use, such as development of irrigated agriculture or parkland may have considerable impacts on vernal pools, although the degree to which such changes affect pools is poorly understood (Rains et al. 2006).

Loss of suitable habitat has been offset to some extent by the development of conservation banks. Stillwater Plains Conservation Bank within the Northeastern Sacramento Valley Region has created suitable habitat for slender Orcutt grass. However, in the last several years the inflated price of land along the urban front in the Redding area has provided an unexpected threat to preservation of suitable slender Orcutt grass habitat by reducing the land-purchasing capability of conservation and governmental organizations (Service 2009).

Slender Orcutt grass occurrences on conservation banks and small preserves are often subject to the same threats as occurrences on unprotected, fragmented habitat. Disruption of perched aquifers underlying small, protected parcels may impact populations within preserves. In addition, development of offsite banks may not adequately protect the rare landform types associated with specific plant species or meet the functional equivalence of the original wetlands ecosystems (see discussion in Wacker and Kelly 2004). In the Southeastern Sacramento Valley Region, Wacker and Kelly (2004) illustrated that the majority of project site characteristics were replicated at the corresponding mitigation sites. However, when compared at the landscape scale across all development projects, they found that relatively rare pool types, such as Northern Volcanic Mudflow pools, are decreasing while Drainageway pools (pools formed in recent alluvial deposits over other formations, which typically support lower species richness) are becoming more common. The four occurrences of slender Orcutt grass in Sacramento County are found on the high terrace Laguna Formation (Sacramento County undated). High terrace formations generally support larger and deeper (longer lasting) pools (Wacker and Kelly 2004). Although projects have occurred fairly equally on high and low terrace sites in the study area, compensation sites were established disproportionately on low terrace formations (Wacker and Kelly 2004). Such shifts in availability of landform types could have negative consequences for persistence of the grass, although the degree of risk is unknown.

In summary, habitat for slender Orcutt grass continues to be highly fragmented throughout most of its range due to conversion of natural habitat for urban and agricultural uses. This fragmentation results in small, isolated populations of this species in all areas but the Modoc Plateau. Highly fragmented, small populations may be highly susceptible to extirpation due to stochastic events, inbreeding depression, or additional environmental disturbance (Service 2009). If an extirpation event occurs in a population that has been fragmented, the opportunities for natural re-colonization will be greatly reduced due to physical isolation from other source populations. In addition, both protected and unprotected populations in the Central Valley may be increasingly subject to decreased suitability of habitat due to competitive exclusion by either native *Eleocharis* spp. (as grazing is discontinued near urban expansion), invasive non-native plant species such as waxy manna grass (Service 2009), or changes in hydrology of vernal pools (Service 2005, Rains et al. 2006, Service 2009).

<u>*Five-Year Status Review*</u>

In November 2009, the Service issued a five-year status review of the slender Orcutt grass, which resulted in no change in listing status (Service 2009).

Critical Habitat

Critical habitat was designated for the slender Orcutt grass on February 10, 2006 (71 FR 7118).

Primary Constituent Elements

The primary constituent elements of critical habitat for *Orcuttia tenuis* (slender Orcutt grass) are the habitat components that provide:

(i) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools described in paragraph (ii) of this section, providing for dispersal and promoting hydroperiods of adequate length in the pools; and

(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and nonnative upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the slender Orcutt grass (Service 2005).

According to the 5-Year Review for this species (Service 2009), Core Recovery Areas include:

- Lake-Napa Vernal Pool Region
- Modoc Plateau Vernal Pool Region
- Northeastern Sacramento Valley Vernal Pool Region
- Northwestern Sacramento Valley Vernal Pool Region
- Southeastern Sacramento Valley Vernal Pool Region

Delisting Criteria

In addition, general delisting criteria and recovery actions (Service 2009) for this species include:

1. Habitat Protection: Accomplish habitat protection that promotes vernal pool ecosystem function sufficient to contribute to population viability of the covered species.

   1A. Suitable vernal pool habitat within each prioritized core area for the species is protected.

   1B. Species localities distributed across the species geographic range and genetic range are protected. Protection of extreme edges of populations protects the genetic differences that occur there.

   1C. Reintroduction and introductions must be carried out and meet success criteria.

   1D. Additional occurrences identified through future site assessments, GIS and other analyses, and status surveys that are determined essential to recovery are protected. Any newly found occurrences may count towards recovery goals if the occurrences are permanently protected, as described in the recovery plan.

1E. Habitat protection results in protection of hydrology essential to vernal pool ecosystem function, and monitoring indicates that hydrology that contributes to population viability has been maintained through at least one multi-year period that includes above average, average, and below average local rainfall as defined above, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

2. Adaptive Habitat Management and Monitoring.

2A. Habitat management and monitoring plans that facilitate maintenance of vernal pool ecosystem function and population viability have been developed and implemented for all habitat protected, as previously discussed in Sections 1 (A-E).

2B. Mechanisms are in place to provide for management in perpetuity and long-term monitoring of habitat protected in Sections 1 (A-E) (e.g., funding, personnel, etc.).

2C. Monitoring indicates that ecosystem function has been maintained in the areas protected under Sections 1 (A-D) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

2D. Seed banking actions have been completed for species that would require it as insurance against risk of stochastic extirpations or that will require reintroductions or introductions to contribute to meeting recovery criteria.

3. Status Surveys.

3A. Status surveys, 5-year status reviews, and population monitoring show populations within each vernal pool region where the species occur are viable (e.g., evidence of reproduction and recruitment) and have been maintained (stable or increasing) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

3B. Status surveys, status reviews, and habitat monitoring show that threats identified during and since the listing process have been ameliorated or eliminated. Site-specific threats identified through standardized site assessments and habitat management planning also must be ameliorated or eliminated.

4. Research.

4A. Research actions necessary for recovery and conservation of the covered species have been identified (these are research actions that have not been specifically identified in the recovery actions but for which a process to develop them has been identified). Research actions (both specifically identified in the recovery actions and determined through the process) on species biology and ecology, habitat management and restoration, and methods to eliminate or ameliorate threats have been completed and incorporated into habitat protection, habitat management and monitoring, and species monitoring plans, and refinement of recovery criteria and actions.

4B. Research on genetic structure has been completed (for species where necessary – for reintroduction and introduction, seed banking) and results incorporated into habitat protection plans to ensure that within and among population genetic variation is fully representative by populations protected in the Habitat Protection section of this document, described previously in Sections 1 (A-E).

4C. Research necessary to determine appropriate parameters to measure population viability for each species have been completed.

5. Participation and Outreach.

5A. Recovery Implementation Team is established and functioning to oversee rangewide recovery efforts.

5B. Vernal Pool Regional working groups are established and functioning to oversee regional recovery efforts.

5C. Participation plans for each vernal pool region have been completed and implemented.

5D. Vernal Pool Regional working groups have developed and implemented outreach and incentive programs that develop partnerships contributing to achieving recovery criteria 1-4.

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Southern Mountain Wild-Buckwheat Critical Habitat

Critical Habitat

The Service listed southern mountain buckwheat as threatened on September 14, 1998 (63 FR 49006). Then the Service designated approximately 904 acres of critical habitat for the species on December 26, 2007 (72 FR 73092) on Federal and private lands. The physical and biological features of critical habitat for this species are (1) pebble plains in dry meadow-like openings within upper montane coniferous forest, pinyon-juniper woodlands, or Great Basin sagebrush in the San Bernardino Mountains of San Bernardino County, California; at elevations between 5,900 to 9,800 feet that provide space for individual and population growth, reproduction and dispersal; and (2) seasonally wet clay, or sandy clay soils, generally containing quartzite pebbles, subject to natural hydrological processes that include water hydrating the soil and freezing in winter and drying in summer causing lifting and churning of included pebbles, that provide space for individuals and population growth, reproduction and dispersal, adequate water, air, minerals, and other nutritional or physiological requirements to the species. For more detailed information about the species description, legal/listing status, distribution and population trends, life history, habitat affinities, and the status of critical habitat, please refer to the mentioned Federal Register documents and the 5-year review for this species (Service 2015)

Literature Cited

[Service] U.S. Fish and Wildlife Service. 2015. Southern mountain wild buckwheat 5-year review: Summary and evaluation. U.S. Fish and Wildlife Service, Region 8, Carlsbad, California. 49 pp. https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=Q0S7

Spreading Navarretia and its Critical Habitat

Listing Status

Spreading navarretia was federally listed at threatened on October 13, 1998, primarily due to habitat destruction and fragmentation (63 FR 54975). Critical habitat was designated on October 18, 2005 (70 FR 60658).

Life History and Habitat

Spreading navarretia, a member of the Polemoniaceae (phlox family), is a low, mostly spreading or ascending annual plant, 4 to 6 inches tall. The leaves are 0.4 to 2 inches long and finely divided into slender spine-tipped lobes. Spreading navarretia depends on the inundation and drying cycles of its habitat for survival. This regime allows for germination and other life history phases of the plant. This annual species germinates from seeds left in the seed bank. Spreading navarretia abundance also varies from year to year depending on precipitation and the inundation/drying time of the vernal pool. This annual variation makes it impossible to obtain an accurate count of the number of individuals in the population because the proportion of standing plants to remaining seeds in the seed bank that makes up the population cannot be measured. Additionally, the occurrences can vary spatially in alkali playa habitat where pools are not in the same place from year to year. After germination, the plant usually flowers in May and June as the vernal pool is devoid of water. The plant then produces fruit, dries out, and senesces in the hot, dry summer months (Service 2009).

Population Status

Spreading navarretia extends from northwestern Los Angeles County to western Riverside County, and coastal San Diego County in California, to San Quintin in northwestern Baja California, Mexico. At the time of listing, 34 populations were known to be extant in the United States, including populations contained in the listing rule and in the recovery plan. Nearly 60 percent of these populations were concentrated at three locations: Otay Mesa in southern San Diego County, alongside the San Jacinto River in western Riverside County, and near Hemet in western Riverside County. At the time of listing, spreading navarretia was documented in less than 300 acres of habitat in the United States (Service 2009).

Spreading navarretia is extant or presumed extant at 66 locations within the United States, and 53 of these occurrences are either being managed in accordance with INRMPs or are fully or partially conserved. A total of 25 locations are considered extirpated or possibly extirpated. Overall, the species remains distributed primarily in western Riverside (21 locations) and San Diego County (41 locations) with a small number of occurrences in Los Angeles (4 locations). The species is also extant or presumed extant at 9 locations in Baja California, Mexico (Service 2023).

The listing rule characterizes the size of spreading navarretia populations as highly variable, identifying two locations in Riverside County with 300,000 and 100,000 individuals (Stowe Pool and San Jacinto River, respectively), while most populations contain fewer than 1,000 individuals. At the time of listing, seven sites in Stowe Pool and Salt Creek occurrences contained an estimated 375,500 plants, including 300,000 in Stowe Pool. The highest report for Upper Salt Creek since listing is 10,500. Additional occurrences along the San Jacinto River have been detected since listing. Occurrences along three of the sections of the river were observed to support approximately 63,500 individuals. In 2005, those same three sections were recorded as supporting 361,000 individuals. The changes in abundance of spreading navarretia along the San Jacinto River and at Stowe Pool illustrate the dynamic nature of the seasonally flooded alkali playa habitat, impacts from agriculture, the results of different methodologies for measuring abundance, and recent climatic variation. As such, abundance of standing plants is not a good measure of health for occurrences (Service 2009).

At listing, spreading navarretia was threatened by development and degradation of vernal pool habitat due to agricultural practices, invasive nonnative plants, and drought conditions and these are still considered threats. Agricultural activities, such as manure dumping (not identified in the listing rule) and discing, are currently affecting some occurrences in Riverside County. The degree to which drier conditions (considered a threat in the listing rule) have caused a rangewide decrease in the abundance of spreading navarretia is unknown. As development surrounds and fragments the remaining habitat, associated effects of human access and disturbance (including off-highway vehicle use, trash and debris dumping, and trespassing) will continue to impact many of the occurrences. These threats continue to affect the existence of spreading navarretia and compromise its potential for recovery (Service 2009).

Critical Habitat

Designated critical habitat occurs in six units in Los Angeles, Riverside, and San Diego counties, California, for a total of approximately 6,720 acres (75 FR 62192). The physical and biological features of designated critical habitat include:

1) Vernal pools (up to 10 acres) and seasonally flooded alkali vernal plains that become inundated by winter rains and hold water or have saturated soils for 2 weeks to 6 months during a year with average rainfall (i.e., years where average rainfall amounts for a particular area are reached during the rainy season (between October and May)). This period of inundation is long enough to promote germination, flowering, and seed production for spreading navarretia and other native species typical of vernal pool and seasonally flooded alkali vernal plain habitat, but not so long that true wetland species inhabit the areas.
2) Areas characterized by mounds, swales, and depressions within a matrix of upland habitat that result in intermittently flowing surface and subsurface water in swales, drainages, and pools described in physical and biological feature 1.
3) Soils found in areas characterized in physical and biological features 1 and 2 that have a clay component or other property that creates an impermeable surface or subsurface layer. These soil types include but are not limited to: CienebaPismo-Caperton soils in Los Angeles County; Domino, Traver, Waukena, Chino, and Willows soils in Riverside County; and Huerhuero, Placentia, Olivenhain, Stockpen, and Redding soils in San Diego County.

Recovery Plan Information

A recovery plan for spreading navarretia and other vernal pool species was released on September 3, 1998 (Service 1998). The delisting criteria include the following:

1) All the existing vernal pools and their watersheds identified in Appendix F and G of the recovery plan should be secured from further loss and degradation in a configuration that maintains habitat function and viability (as determined by prescribed research tasks).
2) Secured vernal pools must be enhanced or restored such that population levels of existing species are stabilized or increased.
3) Population trends must be shown to be stable or increasing for a minimum of 10 consecutive years prior to consideration for reclassification.

Literature Cited

[Service] U.S. Fish and Wildlife Service. 1998. Vernal pools of southern California recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon. 113+pp.

[Service] U.S. Fish and Wildlife Service. 2009. *Navarretia fossalis* (Spreading navarretia) 5-year review: summary and evaluation. 59 pp.

[Service] U.S. Fish and Wildlife Service. 2023. *Navarretia fossalis* (Spreading navarretia) 5-year review: summary and evaluation.

Stebbins' Morning-Glory

Listing Status

Stebbins' morning-glory was listed as endangered on October 18, 1996 (Service 1996, p. 54346).

Life History and Habitat

Stebbins' morning-glory is a leafy herbaceous perennial vine in the morning-glory family (Service 1996, p. 54347). The species is restricted to the Pine Hill Preserve and immediate vicinity in El Dorado County and to two sites near Grass Valley in Nevada County (Service 2019).

Stebbins' morning-glory has stems of up to 3.3 feet in length that generally lie flat on the ground or climb nearby vegetation and rocks. Leaves are palmately lobed with 7 to 9 lobes. White, creamy yellow, and sometimes pink-tinged flowers are on stalks 1 to 5 inches long and bear two leaf-like bracts in addition to being generally glabrous (R.K. Brummitt 2012; Service 2002).

Flowering occurs from April through July (R.K. Brummitt 2012) and is insect pollinated, primarily by bees (Nosal 1997). Though initially thought to be an obligate seeding species, it seems to have the capability to recruit by seed or rhizomatous resprout after fire or other disturbance. Seeds require scarification or heat treatment for successful germination (Nosal 1997; Ayres 2011). It has a seedbank that may persist for over 60 years (Ayres 2011). Plants grow from seed rapidly and flower profusely 2-3 years after fire (Marsh and Ayres 2002). While an above-ground shoot may appear in the same spot for only several years, other portions of this plant's extensive root system might survive much longer (L. Eng *in litt*. 1999).

Stebbins' morning-glory is found in gabbro soils and is also known to occur on serpentine soils. Two of the three serpentine sites for Stebbins' morning-glory in Nevada County are possibly extirpated, but the species continues to persist at one serpentine site in that county and an additional serpentine site near Shingle Springs in El Dorado County (Service 2019).

Threats include alteration of the natural fire regime and encroachment of native plants due to succession. The long fire return interval due to fire suppression is preventing the formation of necessary clearings for Stebbins' morning-glory establishment and possibly the scarification of seeds needed for their germination (Service 2019).

Population Status

At the time of listing, Stebbins' morning-glory occurred primarily on the Pine Hill formation in western El Dorado County, California, ranging in elevation from 453 to 2,060 feet (Service 2019). Stebbins' morning-glory had a few known isolated occurrences in El Dorado, Nevada, and Tuolumne counties (Service 1996).

Recovery Plan Information

On August 30, 2002, the Service issued the Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills, which includes Stebbin's morning-glory.

The downlisting and delisting criteria for the Stebbin's morning-glory include the following (Service 2002):

Downlisting:

- Protection of specified recovery areas from incompatible uses:
    - Cameron Park preserve, south of Highway 50
    - Cameron Park preserve, north of Highway 50
    - Salmon Falls/Martel Creek preserve

    - Occurrences in Nevada County; along with sufficient adjacent unoccupied habitat for fire management and a 150-meter (500-foot) buffer
- A management plan that includes the survival and recovery of Stebbin's morning-glory as an objective has been approved and implemented for all populations recommended for protection and any adjacent areas identified as necessary for continued survival and recovery of the species.
- Monitoring in all recommended preserves shows:
    - Populations are stable or over increasing over one fire cycle (about 30 years) (subject to modification depending on results of fire management studies).
    - Habitat monitoring of recommended preserves shows a mosaic of multiage class stands and habitat fragmentation has not appreciably increased (less than 5 percent) within any preserves over current (2000) conditions.
    - Spatially and temporally, the establishment of occurrences must be greater than the extirpation of the occurrences.
- Ameliorate or eliminate threats.
- Fire management studies.
- Research on genetics of Nevada County population.
- Seeds of disjunct populations stored in at least two Center for Plant Conservation certified facilities.
- Research on propagation techniques if repatriation, enhancement, or restoration are determined to be necessary.
- Maintain metapopulation dynamics of at least 2 very large, 7 medium, and 4 small occurrences throughout the northern and southern portions of the Pine Hill formation; and of at least 1 medium and 5 small occurrences near Grass Valley in Nevada County.

Delisting will be considered when, in addition to the criteria for downlisting, all of the following conditions have been met:
- A management plan that includes the survival and recovery of Stebbin's morning-glory as an objective has been approved and implemented for all occurrences and any adjacent areas identified as necessary for the survival and recovery of the species.
- Monitoring in all recommended preserves shows:
    - No population decline after downlisting during two additional fire cycles (about 60 years); if declining, determine cause and reverse trend.
    - Habitat monitoring of recommended preserves continues to show a mosaic of multiage class stands and habitat fragmentation has not appreciably increased (less than 5 percent) within any preserves over current (2000) conditions.
    - Spatially and temporally, the establishment of occurrences must be at 10 perfect greater than the extirpation of the occurrences.
- Ameliorate or eliminate threats.

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Nosal, T. 1997. A demographic study of Stebbins' morning-glory, (*Calystegia stebbinsii*, Brummit, Convolvulaceae), a California state listed and Federal listed endangered plant species. Unpublished Master's thesis, California State University, Sacramento. 44 pp.

R.K. Brummitt. 2012. *Calystegia stebbinsii*, in Jepson Flora Project (eds.) *Jepson eFlora*. https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=16878, accessed on August 31, 2023.

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[Service] U.S. Fish and Wildlife Service. 2019. Stebbins' morning-glory (*Calystegia stebbinsii*), Pine Hill ceanothus (*Ceanothus roderickii*), Pine Hill flannelbush (*Fremontodendron californicum ssp. decumbens*), El Dorado bedstraw (*Galium californicum ssp. sierrae*), and Layne's butterweed (*Packera layneae*) Five-Year Review, U.S. Fish and Wildlife Service, Sacramento, California. Available online at: https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3436.pdf

In Litteris

Eng, L. 1999. Letter to Wayne White, U.S. Fish and Wildlife Service, Sacramento, California, 6 pp.

Thread-leaved Brodiaea

Listing Status

Thread-leaved brodiaea was federally listed as threatened on October 13, 1998, due to habitat destruction and modification (63 FR 54975). Critical habitat was designated on February 8, 2011 (76 FR 6848).

Life History and Habitat

Thread-leaved brodiaea is a perennial herb with dark-brown, fibrous-coated corms (underground bulblike storage stem). The flower stalks (scapes) are 8 to 16 inches tall. The flowering period extends from March to June (Service 2009). This species is usually found in herbaceous plant communities such as valley needlegrass grassland, valley sacaton grassland, nonnative grassland, alkali playa, southern interior basalt vernal pools, San Diego mesa hardpan vernal pools, and San Diego mesa claypan vernal pools. It grows in interstitial areas (often narrow bands of habitat surrounded by other vegetation) in association with coastal sage scrub in some locations. These herbaceous communities occur in open areas on clay soils, soil with clay subsurface, or clay lenses within loamy, silty loam, loamy sand, silty deposits with cobbles or alkaline soils; they may range in elevation from 100 feet to 2,500 feet, depending on soil series (Service 2009).

Population Status

The historical range of thread-leaved brodiaea extends from the foothills of the San Gabriel Mountains at Glendora (Los Angeles County), east to Arrowhead Hot Springs in the western foothills of the San Bernardino Mountains (San Bernardino County), and south through eastern Orange and western Riverside counties to Rancho Santa Fe in central coastal San Diego County, California. In 2009, the Service estimated that Brodiaea occurred within 68 extant (or presumed extant) locations within cismontane Los Angeles, San Bernardino, Riverside, Orange, and San Diego counties and concluded that the distribution of and threats to Brodiaea had not changed significantly since the original listing (Service 2009). Based on updated information, the Marine Corps has estimated 101 occurrences of Brodiaea throughout its known range (Marine Corps 2017). The difference between the 2009 Service estimate and the 2017 Marine Corps estimate of extant Brodiaea locations is based on an additional 33 Brodiaea locations that have been detected on MCBCP since our 2009 review. Using this updated information, a minimum estimate based on all information available since its listing in 1998 indicate that several million Brodiaea individuals are distributed across the 101 identified locations (Service 2009; Marine Corps 2017).

Currently, the largest natural occurrences of thread-leaved brodiaea are on the Santa Rosa Plateau in Riverside County, the San Dimas/Gordon Highlands occurrence in Los Angeles County, the Cristianitos Canyon/Lower Gabino Canyon occurrence in Orange County, and the Rancho Carrillo and Upham occurrences in San Diego County. Although each occurrence on Marine Corps Base Camp Pendleton generally supports fewer than 2,000 plants, the occurrences on the base comprises a significant portion of all the known occurrences of the plant. No accurate estimate of the overall abundance of thread-leaved brodiaea is available currently. There is no comprehensive survey data of all known occurrences and different survey techniques have been used (Service 2009).

The current threats to this species are essentially the same as they were at listing and include urbanization, alteration of hydrological conditions and channelization, discing, unauthorized off-highway vehicle activity, grazing, and nonnative plants. Additional threats since listing include manure dumping and mowing. Development remains the most prominent rangewide threat to thread-leaved brodiaea, though the protective provisions of the Act have had a significant impact relative to addressing this threat through the development of regional habitat conservation plans and section 7 consultations. As habitat continues to be placed into permanent conservation with adaptive management, the threats to thread-leaved brodiaea will be further reduced rangewide; current conservation efforts address approximately 75 percent of occurrences. The second most significant rangewide threat to thread-leaved brodiaea is competition from nonnative plants, which impact at least 15 of the known occurrences. Other threats from unauthorized off-highway vehicle use, grazing, and manure dumping threaten specific occurrences of thread-leaved brodiaea, and while they are not rangewide threats to the species, these threats hinder recovery (Service 2009).

Recovery Plan Information

No recovery plan has been written for this species.

Literature Cited

[Marine Corps] U.S. Marine Corps. 2017. Thread-leaved Brodiaea (Brodiaea filifolia) Management Plan, Marine Corps Base Camp Pendleton, California. Final, July 2017. 79 pp. + Appendices.

[Service] U.S. Fish and Wildlife Service. 2009. *Brodiaea filifolia* (thread-leaved brodiaea) 5-year review: summary and evaluation. 47 pp.

Vandenberg Monkeyflower Critical Habitat

Critical Habitat

The Service designated critical habitat for Vandenberg monkeyflower in 2015 (Service 2015, entire). The final designation contains four critical habitat units to support populations of the species. The units also include adjacent areas that are essential to maintain the ecological processes necessary for the populations to persist. The Service designated a total of 5,755 acres of Vandenberg monkeyflower critical habitat including: the Vandenberg Unit (223 acres); the Santa Lucia Unit (1,484 acres); the Encina Unit (2,024 acres); and the La Purisima Unit (2,024 acres). This total does not include 4,159 acres of lands within Vandenberg Space Force Base that were identified as areas that meet the definition of critical habitat but are exempt from critical habitat designation under section 4(a)(3)(B) of the Act (80 FR 48148).

We primarily based the designation on the physical or biological features (PBF) that are essential to conservation of the species at the time of listing, which may require special management considerations or protections. The PBFs identified for Vandenberg monkeyflower critical habitat include, but are not limited to:

> Canopy openings (or gaps) within Burton Mesa maritime chaparral habitat that provide space needed for individual and population growth, including sites for seed germination, reproduction, seed dispersal, seed banks, and pollination;
>
> Loose sandy soils derived from the Burton Mesa Dune Sheet that occur within the canopy openings found throughout Burton Mesa maritime chaparral vegetation; and
>
> Contiguous maritime chaparral habitat on the Burton Mesa landform, which provides connectivity needed for seed dispersal and establishment and for intra and interpopulation pollinator movements (Service 2015, entire).

Literature Cited

[Service] U.S. Fish and Wildlife Service. 2015. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for *Diplacus vandenbergensis* (Vandenberg Monkeyflower). Federal Register 80: 48142-48170.

Ventura Marsh Milk-Vetch Critical Habitat

Critical Habitat

The Service designated critical habitat for the Ventura marsh milk-vetch (*Astragalus pycnostachyus* var. *lanosissimus*) on May 20, 2004 (69 FR 29081-29100). Approximately 420 acres (170 hectares) of land fall within the boundaries of the critical habitat designation. The designated critical habitat is located in Santa Barbara and Ventura counties, California. Based on the best available information from the only extant site of the species, the primary constituent elements of critical habitat for Ventura marsh milk-vetch consist of, but are not limited to: (1) Vegetation cover of at least 50 percent but not exceeding 75 percent, consisting primarily of known associated native species, including but not limited to, *Baccharis salicifolia, Baccharis pilularis, Salix lasiolepis, Lotus scoparius* (deerweed), and *Ericameria ericoides* (coast goldenbush); (2) Low densities of nonnative annual plants and shrubs; (3) The presence of a high water table, either fresh or brackish, as evidenced by the presence of channels, sloughs, or depressions that may support stands of *Salix lasiolepis*, *Typha* spp. (cattail), and *Scirpus* spp. (tule); (4) Soils that are fine-grained, composed primarily of sand with some clay and silt, yet are well-drained; and (5) Soils that do not exhibit a white crystalline crust that would indicate saline or alkaline conditions.

Determining what constitutes habitat for Ventura marsh milk-vetch is difficult because there is only one extant wild population, and the site has been altered by soil dumping and oil waste disposal. Also, the historical collections did not fully document the habitat where the plants were found.

Literature Cited

[Service] U.S. Fish and Wildlife Service. 2004. Endangered and Threatened Wildlife and Plants; Final Designation of Critical Habitat for *Astragalus pycnostachyus* var. *lanosissimus* (Ventura Marsh milk-vetch). Federal Register 69: 29081-29100.

Yadon’s Piperia Critical Habitat

Critical Habitat

The Service designated critical habitat for Yadon’s piperia in 2007 (Service 2007, entire). The final designation contains 2,117 acres of critical habitat to support populations of the species. Within this area, the Service designated the following eight critical habitat units: Blohm Ranch, Manzanita Park, Vierra Canyon, Aguajito, Old Capitol, Monterey Peninsula, Point Lobos, and Palo Colorado. We based the designation to include only occupied areas that contain sufficient primary constituent elements (PCEs) to support at least one life history function of the species. PCEs are physical and biological features essential to the conservation of the species. The PCEs identified for Yadon’s piperia are:

1. A vegetation structure providing filtered sunlight on sandy soils:

    a. Coastal pine forest (primarily Monterey pine) with a canopy cover of 20 to 70 percent, and a sparse herbaceous understory on Baywood sands, Narlon loamy fine sands, Sheridan coarse sandy loams, Tangair fine sands, Santa Lucia shaly clay loams and Chamise shaley clay loams underlain by a hardpan; or
    b. Maritime chaparral ridges with dwarfed shrubs (primarily Hooker’s manzanita) on Reliz shaly clay loams, Sheridan sandy loams, Narlon sandy loams, Arnold loamy sands and soils in the Junipero–Sur complex, Rock Outcrop–Xerorthents Association, and Arnold–Santa Ynez complex often underlain by rock outcroppings.

2. Presence of nocturnal moths in the families Pyralidae, Geometridae, Noctuidae, and Pterophoridae.

Literature Cited

[Service] U. S. Fish and Wildlife Service. 2007. Designation of critical habitat for *Piperia yadonii* (Yadon's piperia); final rule. Federal Register 72: 60410-60450.

Yellow Larkspur Critical Habitat

Critical Habitat

The Service designated critical habitat for the yellow larkspur on March 18, 2003 (Federal Register 68:12834-12863). The final designation contains 2,525 acres in 4 different subunits in Marin and Sonoma Counties. Unit L1 at Bodega Bay in Sonoma County consists of 1,369 acers; Unit L2 at Estero Americano in Marin County is 328 acers; Unit L3 at Estero De San Antonio in Marin County is 351 acers of habitat; and Unit L4 at Tomales in Marin County consists of 476 acers.

Designation of critical habitat is based off the presence of physical and biological features that are essential to the conservation of the species. The areas that are designated as critical habitat provide some or all of the habitat components essential for the conservation of Yellow Larkspur. The Primary constituent elements of critical habitat for yellow larkspur are: (1) Plant communities, including north coastal scrub or coastal prairie communities, including, but not limited to, species such as: *Arabis blepgarophylla* (rose rockcress), *Calochortus tolmei* (Tolmei startulip), *Mimulus aurantiacus* (orahge bush monkeyflower), *Dudleya caespitosa* (sea lettuce), *Polypodium californicum* (California polyploidy), *Eriogonum parviflorum* (sea cliff buckwheat), *Toxicodendron diversilobum* (poison oak), *Romanzoffia californica* (California mistmaiden), *Hesperevax sparsiflora* (evax), *Pentagramma triangularis* (goldenback fern), and *Sedum spathulifolium* (broadleaf stonecrop); (2) Relatively steep sloped soils (30 percent or greater) derived from sandstone or shale, with rapid runoff and high erosion potential, such as Kneeland of Yorkville series soils; (3) Generally north-aspected areas; and (4) habitat upslope and downslope from known populations to maintain disturbance such as occasional rock slides or soil slumping that the species appear to require.

Literature Cited

[Service] U.S. Fish and Wildlife Service. 2003. Endangered and Threatened Wildlife and Plants: Final Designation of Critical Habitat for Two Larkspurs From Coastal Northern California. Federal Register 68: 12834-12863.